"Journal of Gas Lighting, Water Supply, and Sanitary Improvement."—July 25, 1916.—Registered as a Newspaper.

Journal of Gas Lighting and Water Supply

Chemical Lib.
AUG 21 1916
UNIV. OF MICH. LIBRARY

Vol. CXXXV. No. 2776.] LONDON, JULY 25, 1916. [68th Year. Price 6d.

O'NEILL'S
OXIDE
GAS PURIFICATION & CHEMICAL CO., Ltd.
PALMERSTON HOUSE, LONDON, E.C.
Telegrams: "PURIFICATION, LONDON."
Telephone: 9144 London Wall.

"TORBAY PAINT"
(REGISTERED TRADE MARK).
The TORBAY PAINT CO.,
26, 27, & 28, Billiter St., London, E.C.
39-41, Old Hall St., Liverpool.

EDWIN LEWIS & SONS,
Britannia & Patent Tube Works,
WOLVERHAMPTON,
LONDON & LIVERPOOL.
E. L. & S.
TUBES & FITTINGS.

GAS & CANNEL COAL CONTRACTORS.
WM. F. RUSSELL & SONS.
Telegrams for all Offices: "MONKLAND."
GLASGOW: 90, Mitchell Street;
NEWCASTLE: Exchange Buildings;
HULL: Exchange Buildings, Lowgate;
LIVERPOOL: 5, Castle St.; &
SWANSEA: Atlantic Buildings.

R. & W. HAWTHORN LESLIE & CO., LTD.
In Stock.
TANK LOCOMOTIVES
Always In Progress.
Locomotive & Marine Engineers & Shipbuilders,
NEWCASTLE-ON-TYNE.

INTERMITTENT VERTICALS.
Adopted all over the World.
Vertical Gas Retort Syndicate LTD.,
17, VICTORIA ST., WESTMINSTER, S.W.
Sole Agents for Australasia—
JAMES HURLL & CO., LTD., SYDNEY.

JAMES McKELVIE & CO.
Coal Owners,
Cannel and Gas Coal Contractors,
17, RUTLAND SQUARE, EDINBURGH.
59, MARK LANE, LONDON, E.C.
Telegrams: "Mackelvie, Fen. London."
Telephone: Avenue 2177.
GUILDHALL CHAMBERS, SANDHILL, NEWCASTLE-ON-TYNE.
24, CHAPEL STREET, LIVERPOOL.
VICTORIA BUILDINGS, BUTE DOCKS, CARDIFF.
Prices and Analyses of all the Principal Cannel, Gas, and Steam Coals forwarded on application.
ESTABLISHED 1840.

W. PARKINSON & CO.
(Incorporated in Parkinson and W. & B. Cowan, Ltd.),
LONDON & BIRMINGHAM.
(See Advertisement p. 146).

STEWARTS AND LLOYDS, LIMITED, 41, OSWALD STREET, GLASGOW. BROAD STREET CHAMBERS, BIRMINGHAM.
TUBES & FITTINGS for Gas, Steam, Water, &c.

ESTABLISHED — 1861 —
Telegrams: "DRY METERS, LONDON."
Telephone: KENSINGTON, 1140.

George Glover and Co., Ltd.
RANELAGH WORKS
Royal Avenue, Chelsea
— LONDON, S.W. —

Highest Awards at the Principal International Exhibitions.
Branches at LEEDS (9, Dewsbury Road) and MANCHESTER (Gaythorn Meter Works, Easton St.).

SPECIALISTS IN DRY GAS METERS—SLOT, KEY, AND ORDINARY.
Every meter leaving George Glover and Co.'s works, irrespective of size—and they build up to 3000 Lights—is regulated and tested for soundness at 12 in. pressure, and for registration not only at the ½ in. pressure prescribed by the "Sales of Gas Act," but at 3 in. pressure with full outlet capacity, so as to prevent "slow" registration even when the meter is overworked.
AGENTS FOR THE PATENT M. & M. SELF-LOCKING SLOT METER PADLOCK.

RITCHIE C.I. PIPES FOR GAS & WATER. MIDDLESBROUGH.

J. & J. BRADDOCK

(Branch of Meters Limited),

GLOBE METER WORKS,

Telegrams: "Braddock, Oldham." Telephone 815. **OLDHAM,**

AND

45 & 47, WESTMINSTER BRIDGE ROAD,

Telegrams: "Metrique, London." Telephone 2412 Hop. **LONDON, S.E.**

MANUFACTURERS OF HIGH-CLASS

GAS STATION METERS.

BRADDOCK'S

STATION GOVERNORS

AND

RETORT-HOUSE GOVERNORS.

IMPROVED

WET & DRY GAS METERS

OF BEST QUALITY.

BRADDOCK'S PATENT

"SLOT" METERS.

FULL PARTICULARS ON APPLICATION.

That Varnish Paint—

Which is elastic with a fine gloss,
Which is durable and cover in one coat,
Which is quick drying and needs no Guards and specially prepared for Street Lamps, Columns, Electric Light Standards, &c., in any shade as required,

Is Manufactured by

DONALD MACPHERSON & CO., LTD.,
Knott Mill, MANCHESTER.

THE GLENBOIG UNION FIRE-CLAY Co. Ltd.

WORKS: Glenboig, Lanarkshire.

OFFICES: 48, WEST REGENT ST., *GLASGOW.*

GAS-RETORTS, HORIZONTAL, INCLINED, and VERTICAL, to New Standard Specification.

—57—
Prize Medals & DIPLOMAS OF HONOUR. Grand Prix Brussels 1910.
HIGHEST AWARD *wherever exhibited.*

The Glenboig Bricks, Blocks, and Retorts combine, in the highest degree, the qualities of not melting, and not splitting, when subjected to the highest heats and sudden changes of temperature, and are, in consequence, found to be economical, even in districts where the local bricks can be had at half the price.

DONKIN

for

GAS EXHAUSTING PLANTS.

VALVES, REGULATORS AND GOVERNORS, COMPRESSORS.

THE BRYAN DONKIN COMPANY, LTD.,

Head Offices & Works, **CHESTERFIELD.**

LONDON OFFICE: MILLBANK HOUSE, Wood Street, WESTMINSTER, S.W.

Chesterfield Telephone No. 84.
London Telephone No. 5388 Victoria.

Chesterfield Telegrams, "Donkin, Chesterfield."
London Telegrams, "Donkin, Vic. London."

JOURNAL OF GAS LIGHTING & WATER SUPPLY.

EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST. LONDON.

VOL. CXXXV., No. 2776.] TUESDAY, JULY 25, 1916. [68TH YEAR.

EDITORIAL NOTES.

Movements over the Way.

WHAT factors above all others have prolonged the waste and ruin of life and substance that have been proceeding for nearly two years, and is now at flood-tide? The organization and preparation of Germany. What before the war was carrying Germany into a matchless supremacy as a world-trading power? Organization, unity, and steady but energetic application. The goal was to make Germany masters of the world, both militarily and commercially, while all other inhabited parts of the Universe were to be reduced to the position of auxiliaries to that supremacy. The factor that permitted such progress to ascendancy was the lack of the same completeness in organization, unity, and preparedness on the part of other countries—Great Britain among them. The success of Germany was becoming an influence—an influence acting as a brake on the actions of other countries. The doings of this country were also being crippled by a disinclination to disturb old institutions, customs, and ways; and by fear as to Germany accelerating her pace on any signs of this country taking example from her methods. The one direction in which this country was bold enough, in the face of great home opposition, to defend her position by action, was in maintaining a supremacy in naval strength. And there is something to be thankful for in this; for the British Navy is the base of coming victory.

From such lessons of vital and world import, the British gas industry should profit. Indeed, the lessons can be applied to every sphere of life. Organization, unity, method, and foresight are all necessary to defence, maintenance, and advancement of interests. The Council of the Institution of Electrical Engineers have come to that conclusion. It has for years been the custom in electrical circles to gird at the Institution over its well-matured apathy to general electrical interests. But the intelligence has been sprung upon the industry—it has come to it as a surprise—that however much the Institution (which has a catholic membership) has deserved reproach in the past, it intends now to make amends. The Institution of Gas Engineers should make due note of this, because the Institution of Electrical Engineers has taken the initial steps to increase its power by promoting opportunities for the accumulation of material wealth for the industry it serves. It is going to make an effort to spread, deepen, and consolidate the base of the industry, and thus make more secure the electrical edifice above. The gas industry should be interested; and it should cause a reversal of the notions of those who hamper efforts at putting new life and solidity into the co-operative work of the gas industry, and whose opposing criticisms contain neither the strength of destruction nor the germs of some alternative constructive policy. Let us see what they are doing "over the way." The Board of Trade not long since appointed Committees to consider the after-war position of certain important industries, and to report what measures, if any, are necessary or desirable in order to safeguard that position. It was announced that two Committees had already been appointed for (1) the iron, steel, and engineering industries, and (2) the shipping and shipbuilding industries. The Council of the Institution of Electrical Engineers detected an opportunity. They at once urged upon the Board of Trade that a similar Committee should be appointed for the electrical trades; and the Board complied. Thereupon, the Institution appointed a Committee to prepare a programme to lay before the Board of Trade Electrical Committee; and it may be commended, as a worthy example, to the notice of the Council of the Institution of Gas Engineers that, although the Committee was only appointed on June 8, the programme which they were asked to prepare has been in circulation in the electrical industry for the past fortnight or more.

In some of the proposals of the Committee, we have nothing more than a general interest; and most of the others—not all—are peculiar to the electrical industry. But every industry ought to be able to suggest reasonable schemes for the defence, maintenance, and promotion of its interests and position. The programme is a recognition by the Institution of Electrical Engineers of the oneness of the several elements that comprise the industry—that is to say, that the "industry" is not constituted of professional men only, but of elements each of which is indispensable to the others, and the progress of each of which is beneficial to the others separately and collectively. The very first submission of the programme is that some combination is desirable of British electrical firms especially with regard to overseas trade. Here we see the electrical engineers actually interesting themselves in the business of the trading section of the industry, although there is already in active existence the British Electrical and Allied Manufacturers' Association. The industry, however, is a component in the national structure; the plant manufacturers form a component of the industry; and the electrical engineers are components of both nation and industry. The interconnection cannot be destroyed by any artificial means such as some members of the Institution of Gas Engineers attempt to establish. Also bearing on trade, the proposal is put forward in the programme that, in view of the necessity of securing home markets, and that none other than British electrical apparatus be purchased in the United Kingdom, a protective tariff should be set-up, notwithstanding such benefits as will in any case result from patriotism. There will be differences of opinion on this point. But the war has altered the groundwork of many a dearly cherished political canon; and now that in some respects in this connection, apostasy connotes patriotism and expediency, there is some honour in being an apostate. But in securing the home markets, discrimination is necessary, lest some day we find ourselves in a tight corner for some necessaries, though truly we have not done at all badly in this country while the Germanic factories and marts have been closed to us, with the locks and keys in the keeping of our own Navy. There can also be approval, with the qualification that it contains [as italicized by us], of the expression of opinion that a permanent Advisory Committee should be appointed to ensure that, *as far as possible*, raw materials and parts, as well as whole apparatus, necessary to the trade of the British Empire shall be produced within the Empire. Electricity supply undertakings were before the war large buyers from abroad, and not because (in one direction) our electrical manufacturers could not produce of equal quality and efficiency, but because they could not sell at prices as low as those of many of the goods from abroad. But in other directions electricity undertakings were compelled to buy abroad, simply because production here was unequal to the demand; and in certain cases this was due to the discouragement to expansion of productive capacity occasioned by the patronage of cheap-made goods abroad. This is not one of the means adopted by the Germans in endeavouring to secure empire in trade, or the nearest approach to it that they could.

However, we come to matters that have closer interest for such trade competitors as gas suppliers. The Committee of the Institution of Electrical Engineers are desirous that the internal organism of the electric supply industry shall be made more effective for business by co-ordination. Everything that goes to strengthen the electricity industry improves its competitive position; the same with gas supply. Therefore, we have the recommendation (whether or not we agree with it entirely, with in mind the work of the State Commissions regulating public utility concerns in America) that a Government tribunal should be appointed, of the most independent character that can be devised, to control

the electricity supply industry of the country, and also to prevent indiscriminate additions to, or extensions of, power stations or systems undesirable from the point of view of size, locality, or system. The forepart of this recommendation suggests a body that should be extremely powerful; but its usefulness would depend upon the direction in which it exercised its influence and authorization—whether with the view to facilitating to the public behoof the operations of the industry, or whether oppressively, as in the case of some of the State Commissions of America.

There has been complaint that the Institution of Gas Engineers does not do anything to defend or promote the status of the gas engineer. The Committee of the Institution of Electrical Engineers propose that the body be granted a Charter. For what purpose? "To improve the status "and training of electrical engineers." They also go on to suggest that a Central Engineering Board, consisting of representatives nominated by all the important Institutions, should be established, whom all engineers (other than mechanics) would be required to satisfy as to the sufficiency of their technical and general education before being recognized as proficient, so as to ensure that every engineer shall qualify for his profession in the same manner as a doctor or a solicitor. It is not known whether the Institution of Electrical Engineers look upon the Institution of Gas Engineers as an "important" Institution. Some learned and other technical bodies do not, judging by their neglect. However, the intention of the proposal will have the ratification of all with professional interests at heart; but we fear a grievous mess will be made of the work of the Engineering Board, unless standards of knowledge are separately fixed for each specialized branch of engineering. For example, the man entitled to call himself a gas engineer must to-day not only have a thoroughly sound knowledge of constructional engineering, but must be a good mechanical and distributing engineer in special lines. Most of them, too, must to-day be versed in chemical and electrical engineering; and many, too, are called upon to do railway, water supply, and bridge-building work.

The evidence accumulates that what is wanted in the gas industry is a premier organization alive to the trend of current affairs, and powerful in dealing with them so far as they relate to, or affect, the interests of the gas industry—wherever they may be found, and whatever their state in importance.

"Cultured Industrialism."

In the chemical industrial world, problems relating to specific substances and processes, unless of importance to the war, have been largely, but temporarily, laid aside; and attention is—at any rate, in public discussion—being directed to those things that are of immediate concern, and that are intended to be constructive in the future. The accusation again and again levelled at every person deemed responsible is that, in the latter regard, many things have been left undone that ought to have been done. And when confronted with the amount of scheming and design presented from here, there, and everywhere for utilization in the building-up of a better future than past, one is almost overpowered by the apparently gigantic character of the neglect of peace times, which neglect is the equivalent of the constructive work that has to be taken in hand (though time losses can never be recovered) in order to raise the country to its rightful plane in productive efficiency. That progress has not been up to the level of our inherent capacity is clearly not due to lack of native advising ability. Hitherto, either counsel has been lying dormant, or it has been grossly disregarded through want of receptivity or appreciation of truths; for the fact has very material proportions that, since the war began, there has been a constant stream of advice as to what the country should now do to retrieve the losses of backwardness in developing its brain and industrial resources. But, generally speaking, advice of the kind was not encouraged before the war; for some men of industry viewed with supreme contempt many of the men from whom the advice came. "They had no "practical experience; they were visionaries; they were "all very well in their own particular spheres; but they and "their fads and fancies were not wanted in the realms of "industrial activity." There was, of course, not universal content among men of industry with things as they were; but unconcern as to the association of science and industry was rampant in the land.

To-day, we have manufacturers who have blended science with their work advising as to what must be done to cause the country to go ahead in developing its resources, and in producing material gain for the nation. Mr. Charles Carpenter, D.Sc., is one of them. He cannot be assigned a place among the devotees of pure science; but he has place, and a very prominent one, among engineers and manufacturers who have long since brought chemical and physical science, through their own research and control laboratories, to be the guide and friend in the practical work which is directed to giving a supply of the best quality products at (taking the case of the gas industry) the lowest possible price for the primary one, and at fair market values for the secondary ones. He has practised what he preaches; and therefore when, as President of the Society of Chemical Industry, he, in his address, urged upon learned professors the absolute necessity of a "cultured industrialism" (the expression is an apposite one), when he urged upon industry the acceptance of the faith that only through science can it be developed and prosper, and when he warned statesmen that the neglect of the principles enunciated would be as deadly to the nation as disregard of its health and morals, he was speaking of those things of which he has knowledge through personal action, and so experience. The warning to statesmen is much needed. If we follow the trail of the neglect of the past—the neglect to provide for the full stimulation and control of industry by scientific training and investigation—we find it running from high governmental places down through the industries and the various grades of industrial process. The serious political error has been made, and has through the years had consistent existence, of neglecting the foundations of national prosperity—leaving them to the care almost entirely of private enterprise—while on those foundations politically designed fabrics of gorgeous parts and features have been constructed, many of which have been a heavy strain upon industry.

The fault for this condition lies with the educational system; for the system under which the statesman is educated no more qualifies him for wholly appreciating the alliance that should exist between science and industry, and the importance of that alliance to the nation, than does the same system in inducing a manufacturer to make scientifically trained men just as much a part of his industrial organization as his capital, his machinery, and his labour. There are the industrial research and control chemists. They have, in the material and vital interests of this country, to be provided and brought into industry on a scale which will contribute to a faster rate of industrial expansion, and to a higher efficiency and economy. With the provision of skilled chemists, will our manufacturers, inquires Mr. Carpenter, avail themselves of them to the full? The questioner does not venture upon any categorical reply. There is the danger of a slip. Recognition of the necessity of alliance grows in industrial circles; custom dies hard. The manufacturer has sought the occasional services of the skilled chemist expectant of immediate tangible results; and, because he has not given liberty and had patience, he has been disappointed, and has lost faith in the efficacy of science as a stimulant to industry. One of the difficulties of the present is the breaking-down of old reserve, old prejudices, and the old beliefs rooted and flourishing on an inexact, and certainly incomprehensive, experience.

Having found the skilled men, and manufacturers desirous of utilizing their service, much depends on the chemists themselves as to the degree of their practical success. Superiority is a bad sign to hang out in view of workmen and foremen; collaboration is a better one. The amount of practical result, according to his opportunities, that is found in the work of the chemist is the index to his efficiency not only as a chemist, but for occupying a place in industrial operations and surroundings. The same in bringing new processes with a chemical base into large-scale application. The chemist cannot do without the aid of the engineer in realizing the most fruitful development. Chemists should heed these things, because, looking back, the President sees the road strewn with chemical inventions which have failed to mature owing to the engineering difficulties attending their development, and which difficulties might have been surmounted by co-operation. "The mutual obligation to each "other of the chemical and engineering services is," remarked Mr. Carpenter, "an increasing one, of which a very "good example is the synthetic production of nitrogen "compounds." Passing on, there is strong commonsense in the utterance that the manufacturer who seeks the highest

chemical yield and the highest mechanical yield stops short of his goal if he overlooks the part played by labour, and does not also aim at its highest efficiency. The President waxed warm over the part taken by labour in industry, and as to the influence it can exercise in the great industrial expansion scheme. "It would take many inventions and "much wisdom in management to do for industry what its "own labour could do, were it but imbued with the idea "of how much could each industrial unit turn out instead "of how little." And again: "Efficiency is not only con- "cerned with raw material, but per unit of human life em- "ployed." The philosophy of a wide experience in intimate association with the working man, and under the health-giving principles of co-partnership, is expressed here. So passing through the address one gets more and more impressed with the view that, if the Government would only take as their guides, in considering the matter of State aid in furthering the nation's interests through the industries, men having practical experience of "cultured industrialism," we should make greater pace in the work of industrial reformation, expansion, and defence than is likely to be the case under present circumstances, with Government advisers largely of the political brand.

Coal Prices and Coal Conservation.

If ever coal is brought under complete statutory control, it must be control of an effective and prudent character. We have had regulation imposed during the war upon coal exports and coal prices. Over coal exports, regulation is beneficially exercised by an independent Committee; over other coal questions, such as home prices and home use, the Board of Trade, with good old-fashioned complacency, are exercising control by assisting the coal owners in securing money compensations for any little inconvenience experienced in the rate of accumulating profits under the Price of Coal (Limitation) Act. We saw this in the solicitude of the Board to place in the hands of the coal owners, by curtailing home use, a larger supply of coal for export to neutral countries, and for which coal any price may be charged that those countries are willing to pay. In last week's JOURNAL," it was mentioned that the Board had permitted the South Wales coal owners to add 2s. 6d. per ton to the 4s. standard addition prescribed in the Limitation Act. Over this, trouble is threatened. Other Owners' Associations are appealing to the Board to allow them also to squeeze more out of the pockets of home consumers. But the miners are on the track of this concession to the owners, which they do not like for two reasons. The first is that the percentage increases of wages, since the Act came into force, are made the excuse for the addition to the standard 4s.; and the second is that the miners are averse to any unjustifiable advance in coal prices being inflicted on the poorest sections of the community—more especially if these sections are to understand that this is due to the greed of fellow workers, instead of being their due under the prices secured by the owners. The miners might also be informed that to the higher price of coal is due the higher price of gas; and there must be in this country (including both statutory and non-statutory concerns) not far short of 5 million prepayment gas consumers, who are in the main of the wage-earning classes, and who have to pay the extra price for gas as well as for coal. The 1914-15 Board of Trade returns show that the statutory undertakings alone had 3,908,834 consumers using gas through prepayment meters; and the number has increased the past eighteen months. If the coal owners have their way over an increase of the 4s. standard price, it is quite on the cards that—under the conditions explained in a paragraph in last week's "JOURNAL," p. 107—the prepayment as well as the ordinary gas consumers will have to pay a still higher price for their gas. The outlook is not a pleasant one for the coal proprietors and the Board of Trade; for the Executive of the Miners' Federation, through a resolution, and through their President (Mr. Robert Smillie), has made it quite plain that the miners are not going to sit quietly by, and allow the coalmasters to increase their profits at the expense of the home consumer, and that they are quite willing to co-operate in any general movement of organized labour that may be made to secure a revocation of the concession of an increase in the standard of 4s. It is clear that the resentment the miners feel over this matter will not assist the leaders in their endeavours to increase output by the reduction of absenteeism.

There are two or three interesting points touching the question as to justification for an increase of the 4s. standard on the ground of the advance in the miners' wages. It should not be forgotten that miners' wages are not raised on possible prospective prices, but on prices already actually paid. Mr. Smillie states that in South Wales, the average selling price of coal prior to the war was 16s. per ton; and that the present average is 24s.—an increase of 8s. Each 5 per cent. advance in wages costs 4d. per ton on the price of South Wales coal. The increases in wages have augmented the cost of coal by 3s. 8d. per ton—thus leaving a balance of 4s. 4d. to meet the enhanced cost of production from other causes, and to give additional profits to the owners. In the Midland area, the average selling price of coal prior to the war was 8s. 2d. per ton; the latest figure is 13s. 11d. per ton. The increase in wages there has cost the owners 2s. 3d. per ton; leaving a balance of 3s. 6d. for increased profits and other augmentations of the cost of production. In Scotland the realized selling price of coal in 1914 (April) was 8s. 10d. per ton; in April, 1915, 11s. 8d.; in April, 1916, 14s. 10d. Wages have increased there by 2s. 6d. per day. It has been agreed that in Scotland it costs 5d. per ton increase for every 6d. advance in wages. The extra cost of wages is therefore 2s. 1d. per ton; leaving a balance of 3s. 11d. per ton for the coal owners. Can these figures be refuted? If they cannot be, then what was the nature of the information upon which the Board of Trade based their action in conceding in the case of South Wales the additional 2s. 6d. per ton on the standard of 4s.? If the figures cannot be disproved, then the Board of Trade, should further trouble arise, will only have themselves to thank for being so easily led by the coal owners. There has been other indication of this easy leading; and large consumers of coal have not, in consequence, been impressed by the quality of the independence and the judicial acumen of the Board.

While upon the subject of coal, reference may be made to a section in the Presidential Address to the Society of Chemical Industry which refers to the conservation of coal, and to national protection in relation to its utilization. The point of view which Mr. Carpenter takes is an old one with him; and he has seen no occasion to shift from it, notwithstanding the shower of precepts to which the country has lately been treated by the economic pundits, who sometimes err in the application of their principles by narrowly looking at immediate material gains, instead of broadly to the ultimate gains, if, indeed, such they be. We hear from them of the economic importance of increasing the exports of coal; but they say nothing as to the economic absurdity of squandering the country's capital and reserves of raw material which, when drawn upon for supply to other countries, places in their hands good material from which to make commodities with which to compete with similar home productions. Economic laws are subject to circumstances; and the circumstances of coal are different from those of manufactured goods, or raw products whose yield has no limitations. The bulk of coal owners and users are, Mr. Carpenter says, busily engaged squandering the country's capital, or bartering it away, and living on the proceeds. This is an important question for the nation; and, while the nation is quite willing that its Allies should have all the coal that in their extremity they require, it considers that otherwise generous dealing with our raw material should be reserved for this country, thus assisting in the industrial developments to which we are looking. A couple of pertinent interrogations were put by Mr. Carpenter: "Should the development and utilization of our "coal resources be left unrestrictedly to the individual, or "group of individuals, acquiring mining rights?" "Should "the payment of 2d. or 3d. per ton be the solitary factor "deciding whether or not the nation's coal leaves its shores "to be worked up into bye-products by the nation's com- "petitors in industry?" All experience prompts a very decided negative; and we can deduce the answer Mr. Carpenter would himself give from his suggestion that provision of fuel for metallurgical purposes abroad should be made by exporting coke from this country, instead of coal, and so leaving the bye-products to be utilized and handled here. This would not suit the book of our competitors. They want greater value to be represented in the cubical space occupied in the hold of a vessel by a ton of coke than is provided by the material. They are not to be blamed; the desire is a very sensible one. Similarly circumstanced, we should entertain the like wish. But we are not out to deal upon philanthropic terms with other countries; for such a

compliment and such benevolence are not reciprocated in equivalent manner. If, therefore, coal must be exported, then, says Mr. Carpenter, let substantial duties be paid to the State. He goes farther than this, and suggests that the economical use of coal should be fostered at home by every user satisfying the authorities before being granted quantitative licences for its consumption. This is going a long way on the road to absolute control. Do the conditions warrant it? That is too big a question for treatment without extensive consideration. But after the prodigal waste of the past, it can be at once admitted that only drastic measures in respect of use will preserve to this country the full value contained in the complex composition of the crude material.

Extracting Tar Fog from Hot Gas.

Working on the old lines, processes may be perfected until they, in their existing state, appear to be as highly efficient as is possible; and to ordinary workers they do not seem to merit being stamped as crude, until other suggestion comes from someone who has been quietly working to ascertain whether there is not something better to be achieved beyond the former stage of development, or by striking out into an entirely new method of treatment. The paper on the development of tar processes that Mr. G. T. Purves read at the meeting of the Society of Chemical Industry is attractive for the reason that, while it does not show any definite development, it reveals the author as attempting improvements on lines that commend themselves as practical. In the first place, in the direct recovery of sulphate, the gas must be freed from tar fog before it enters the saturators; and the separation of tar fog from hot gas has been a very difficult problem, and the price that has to be paid in energy has been, and is, very high. The simple scrubbing action originally practised is not suitable for treating hot gases for tar fog removal; something much more intensive is wanted. Various methods have been proposed and adopted; but they are not so efficient as is desirable, and the energy required is far from the stage of economy. One method is the use of sprays, or a single spray, of tar and liquor. The direction in which Mr. Purves is experimenting is with the use of a spray of liquor as free as possible from tar, with the object of realizing a higher efficiency with a less volume of liquor and a reduction of the energy absorbed. This he believes is to be effected by supplying the liquor at a high velocity and finely pulverizing the spray—the velocity being determined by the pumping pressure, while the subdivision of the spray is to be influenced not only by the pumping pressure, but more particularly by the design of the spray nozzle. We shall look forward to congratuing Mr. Purves on the achievement of that of which he is hopeful—an efficient extraction of tar fog from hot gas, with a saving of possibly 70 to 90 per cent. in energy.

Fractional Collection of Tar.

In suggestion, Mr. Purves does not stop at that point. The extraction of tar fog from hot gas which is essential to the direct recovery of sulphate is the starting-place to the further possibilities in development—that is to say, the fractional collection of tar. In the recovery of benzol and its homologues, he is not at all satisfied with the present roundabout practice of securing one portion by completely cooling the gas, and then washing the gas for the remainder. He is looking to the simple washing of the gas, and recovering the whole benzol content in one operation, precedent to which must be the removal of the tar fog from the hot gas, and the recovery of the ammonia by a direct, or at least semi-direct, process. The author tersely sums up his view when he says it appears to him that all the arguments which justify the production of sulphate of ammonia direct instead of through the intermediary of a crude liquor, also justify the production of tar products in primary fractions without the intermediary of a crude tar. If fractional collection is adopted at the seat of coal carbonization, then each class of tar could at once receive the fractional separation most suited to its composition, and so reduce the distillation processes. The proposal is fascinating; but practical accomplishment is another matter, and does not appear to be immediately at hand. Relative economy is a consideration; but if subsequent work can be avoided by an economical development at the source of tar production, it will be a valuable departure from something that is admittedly crude.

Oil Washing for Benzol and Toluol Recovery.

There is in this country strong belief in voluntary effort, though compulsion must sometimes be applied when there are recalcitrant folks to deal with, or folks who are too lazy to do anything so long as others are willing to work, or are too indifferent to move themselves even when their own country is at a very critical stage of its existence. The High Explosives Department of the Ministry of Munitions has been well pleased with what the gas industry has done in the way of benzol and toluol recovery; but the war has now risen to the maximum intensity and requirement, and supplies must be equivalent. Therefore the desire that oil washing shall, where possible, displace tar washing, and for this to be done with general willingness. In the work of stimulating interest among gas engineers in respect of this change, thanks are largely due to the British Gaslight Company. We remember what was recently done at Norwich, in inviting numbers of gas engineers to inspect the oil-washing plant there; and now the Company have had the engineers and managers of a considerable number of Midland works to visit their Etruria station, to see what Mr. Harold E. Copp is doing there in complying with the desires of the Ministry of Munitions. It will be seen from a report in other columns to-day that the plant is the work of the Chemical Engineering Company; and one of the features is the tandem fashion in which Mr. Copp has had it laid out, which gives the position of the components sequence with the operations from beginning to end of the process. Mr. F. L. Halford, of the Ministry of Munitions, accompanied by his technical *aide-de-camp* (Mr. W. Doig Gibb) was present at the inspection; and the Midland engineers were headed by the President of their Association (Mr. C. H. Webb, M.Sc.). It was a highly interesting visit; and Mr. Copp, through the support of his Chairman (Mr. R. S. Gardiner) and Directors, left nothing undone to make it so.

The Position of the Calorific Standard Bill.

The Gas (Standard of Calorific Power) Bill was read the third time in the Lords last week, and was returned to the House of Commons for their endorsement of the amendments made in the Bill. Seeing that the amendments were willingly accepted in the Lords by Lord Stanmore on behalf of the Government—in fact, he himself was responsible for the second one, that the word "Special" should be omitted from before the words "Act or Order" in clause 1 of section 1—there is no question that they will be formally adopted by the Commons. It may therefore be taken that the Bill is as good as Royal Assented. The important amendment deals with the revision of minimum pressure prescriptions; and this was the subject of comment in the "JOURNAL" last week.

Home-Made Dehydration Plant.

Some managers of the smaller gas-works are doubtful whether they will ever have, on account of the first cost, a tar-dehydrating plant as part of their works equipment. But the time will come when no gas-works of any but the very smallest size will be complete without such a plant. The general experience appears to be that, properly worked, such a plant pays now (where tar distillers deal at all fairly) and will pay better still when road authorities again have recourse to the free use of tar on roads for dust-laying and crust-preservation. A tar dehydration plant really need not cost a great deal of money. Mr. Wyver, of Whitstable, has proved this. For £100 he has put down a serviceable plant; and with the exception of the boiler shell which he uses as a still, and a special casting—the tapered still head—he found all that was requisite for building-up the plant in stock and among odd materials lying about the works. In a short article in another column, he gives a detailed account of the home-made plant; and anyone reading the description will have no difficulty in going and doing likewise—that is, if the reader's position is not affluent enough to buy one or other of the excellent dehydration plants now on the market. Mr. Wyver proves that it must be a very poor gas-works indeed that cannot have its own dehydration plant, and that it must be indifference rather than money that stands in the way of installation. We see that Mr. Wyver states that he distils his tar at a temperature of 200° to 218° C. That is somewhat lower than is prescribed n the Road Board's specification; and it is certainly not quite high enough

to denude the tar of toluol. But if one works at a temperature above (say) 220°, the tar becomes so thick that it is rather difficult to deal with, without treatment to render it fluid again.

After the War Policy.

The Prime Minister has appointed a Committee to consider the commercial and industrial policy to be adopted after the war, with special reference to the conclusions reached at the Economic Conference of the Allies in Paris. This Committee is interesting to the gas industry not only in the matter of composition, but in respect of the questions specifically referred to it. The Right Hon. Lord Balfour of Burleigh is the Chairman; and we know him as a robust, practical, far-seeing Chairman in connection with Private Bill work in the House of Lords—though not in evidence so much now as formerly. Among the members of the Committee are noticed Sir Alfred Mond, Bart., and Mr. Arthur Pease, both of whom have more or less direct connection with the gas industry. Sir Alfred Mond is the Managing-Director of Messrs. Brunner, Mond, and Co., and Chairman of the Power Gas Corporation; and Mr. Arthur Pease is a colliery owner. The Committee also include the Chairmen of certain Board of Trade Committees who are considering the position of various important industries. Among these is Sir Henry Birchenough, K.C.M.G., who is a Director of the Imperial Continental Gas Association, the Continental Union Gas Company, and the Danish Gas Company. He ought to be most useful to the gas industry.

An Essential Industry.

The first specific question referred to the Committee is: "What industries are essential to the future safety of the nation, and what steps should be taken to maintain or establish them?" Considering the position of the country and her Allies in respect of high explosives at the beginning of the war contrasted with the position to-day (which is much envied by the Central Powers), the Committee should have no difficulty whatever in finding that the gas and the coke-oven industries are highly essential to the future safety of the nation. They are also exceedingly necessary to the maintenance and expansion of other industries, not only in connection with dyes, motor oils, fertilizers, &c., but in the supply of gaseous fuel and coke. The coal carbonizing industries should assuredly easily take first place among the essential industries. Something might be said as to sulphate of ammonia upon the second point of reference: "What steps should be taken to recover home and foreign trade lost during the war, and to secure new markets?" The gas industry has also interest in the last two questions: "To what extent, and by what means, the resources of the Empire should be and can be developed?" and "To what extent, and by what means, the sources of supply within the Empire can be prevented from falling under foreign control?" In respect of thorium nitrate and mantles, particularly, the gas industry has had enough of foreign control.

Gas and the National War Savings Week.

Last week was "War Savings Week;" and one of the objects was to fix the attention of all classes on the supreme needs of the nation in the present crisis of the war. In big advertisements, the National War Savings Committee had something to say upon the question of how everybody could help by saving labour and money. Among the instances cited of how economy and money savings were to be effected was the reduction of the use of coal, electric light, and gas. In all conscience, the consumption of gas has by various means been sufficiently reduced—reduced, in fact, to the minimum allowed by absolutely necessary purposes. This is a proposal that the more it is examined, the more absurd it is. Economize in labour. Very well. For that purpose, gas is splendid as an economizer. To reduce the amount of coal consumed in the household grate is also an excellent thing, because, to the extent of the reduction, there is a saving of valuable constituents of the coal which are wanted now, and will still be very much wanted after the war. People, however, do not burn coal in these months for room warming, but only for cooking and other requisite household needs; and for these purposes if they do not use coal, they must employ gas. If people reduced very much the amount of fuel they are at present consuming for cooking, cleansing purposes by hot water, &c., a change would not be long coming over the health of the nation, and that change not for the better. This would be a dear piece of fuel-economizing and money-saving. There have been far more sensible suggestions made than this particular one for assisting in the present crisis.

Coal and Coke Exports.

The Board of Trade returns for June show a further reduction in the quantity of coal exported compared with the corresponding month of 1915, and the normal month of 1914. The figure for June, 1914, was 5,734,220 tons; for June, 1915, 3,557,306 tons; and for June, 1916, 3,265,698 tons. These returns show that, whereas June, 1915, presented a reduction of 2,176,914 tons upon June, 1914, June, 1916, increased the reduction, in comparison with June, 1914, to 2,468,522 tons—that is to say, last month saw 291,608 tons less coal sent out of the country than June, 1915. The requirements of France were not quite so heavy last month as in the corresponding month of 1915—the respective figures being 1,497,923 tons and 1,546,559 tons. The quantity taken by France in June, 1914, was 965,326 tons. The amount of coke exported in June, 1916, was 139,574 tons; in June, 1915, 52,713 tons; in June, 1914, 73,163 tons. This is satisfactory, as is also, in the circumstances, the continued lessening of the exported coal. Regarding the figures given last week [p. 110] of the total quantities of coal sent abroad the last two years, the figures exhibited a decline in 1915 upon 1914 of 15,505,320 tons—that is to say, from 59,039,880 tons in 1914 to 43,534,560 tons in 1915. These figures (the year 1914 not being a normal one) do not enable one to judge as to the total reduction that has been made in exports, which help to compensate for the difference in quantity raised. In 1913, 73,400,118 tons of coal were exported; so that the amount sent abroad last year was nearly 30 million tons below the 1913 figure.

PERSONAL.

Mr. G. R. Garner, the Secretary of the Bridport Gas Company, Limited, is retiring, after forty years' service. The vacancy is to be filled by the appointment of Mr. W. H. Reed, the present Engineer and Manager.

In compliance with the wishes expressed at the last annual meeting of shareholders in the Sandown Gas and Coke Company, Limited, happy recognition has been made of the record established by Mr. Richard Woodward, the present Chairman, who has attained his jubilee as a Director. At a recent meeting, Mr. Woodward was presented by his colleagues with a handsome silver salver, suitably inscribed, together with a pendant for Mrs. Woodward, and two framed photographs of the esteemed Chairman, one of which has been hung in the offices of the Company. Mr. Woodward has all along maintained a keen interest in the welfare of the Company.

The many friends in the gas industry of Mr. Archd. H. Hamilton, of Messrs. Archd. H. Hamilton and Co., of Glasgow, will be pleased to hear that he has now sufficiently recovered from his accident to enable him to go to the country for a change. Eight weeks ago, Mr. Hamilton met with a very serious burning accident to the face and hands, as the result of a fire in the laboratory at the Possilpark Paint Works, where he was superintending the carrying out of an experimental test in a varnish-making preparation; and he had to be removed to a nursing home. We are glad to learn that he has made a very good recovery, and is not likely to suffer any permanent ill-effects.

OBITUARY.

SIR WILLIAM RAMSAY.

The death occurred, at his residence at Haslemere, on Sunday, of Sir William Ramsay, K.C.B., LL.D., D.Sc., F.R.S., Emeritus Professor of Chemistry at University College, London. A chemist of great eminence, he took considerable interest in the gas industry, in favour of which he on various occasions gave evidence in the Parliamentary Committee Rooms. Some of the advantages which he perceived in gas were set forth in a speech which he made four years ago, at the Smoke Abatement Exhibition in London, the following extract from which is quoted by the compiler of "Competition Points for Gas Salesmen:" "During the last few years, I have been working with gases, in large and small quantities. This has brought me to the conclusion that the easiest thing in the world to manage is gas. Although we cannot see it, we know where we have it. It will change from place to place, just as one chooses; and, by pressure at one end of a pipe, one can make it stream at whatever rate and pressure one likes. At the other end of the pipe, one can do what one wishes with it. Coal gas is easily conveyed, and very easy to work with."

Born in Glasgow in 1852, Sir William Ramsay, when eighteen

years old, went to study chemistry in Germany, first of all under Bunsen at Heidelberg. Two years later he was back in Glasgow, at Anderson's College and the University; and in 1881 he became Principal at University College, Bristol. It was seven years after this that he took the Chair of Chemistry at University College, London, which he occupied until about three years ago. Of all his useful work, without doubt that which added most to his fame was the fruitful research he undertook in connection with the gases argon and helium. As author of various technical works, he rendered great assistance to the chemical profession.

It would be impossible to enumerate all the tokens of recognition of Sir William Ramsay's scientific work. He was made a K.C.B. in 1902, elected a Fellow of the Royal Society in 1888, and was President of the British Association in 1911.

The funeral takes place at Haslemere Church to-morrow (Wednesday) afternoon.

The death has taken place of Mr. Joseph Smith, formerly Manager of the Hawick Gas-Works. A native of Ayr, he was at one time Manager of the gas-works at Maryhill, and was appointed to Hawick in 1869. One of his sons is Gas Engineer at Belfast, and another at Stirling.

Second Lieutenant Frederick Bertram Key, of the Royal Warwickshire Regiment, who was killed on July 1, was the only child of Mr. F. Key, the Manager of the Lichfield Gas Company. He enlisted as a private in September, 1914, and went to the front the following March, receiving his commission on the battlefield last April. Among the many expressions of sympathy his father has had is one signed by every man employed at the Lichfield Gas-Works. A letter has also been received from a wounded fellow officer who was with Lieutenant Key to the last. In this, the writer says: "It is something to know that he died as a very gallant officer and a gentleman, fighting for home."

Mention was made in the "Journal" a fortnight ago of the fact that Second Lieutenant A. V. Ratcliffe, of the 10th West Yorkshire Regiment (a nephew of Colonel Brotherton, the Chairman of Messrs. Brotherton and Co., of Leeds), was reported "missing, believed wounded." We are sorry now to learn that he was killed in action on July 1, while gallantly leading his company at the third-line German trench near Fricourt. He was 29 years of age, and, joining the army on the outbreak of war, went to France in March last. Captain W. W. Hunter, R.A.M.C., in the course of a letter to his mother, says: "He fought well, and managed to reach almost the third-line German trench before he was hit. Death was practically instantaneous. Your son's work was very highly thought of by his Company Officer, who also lost his life in the fight. His senior officer having been killed early on, your son was commanding the company at the time of his death. From where we found his body, he must have led it pluckily and well. It may be some consolation to know that the regiment fought magnificently, and that your son helped largely towards this distinction."

PATENT LAW CONSIDERATIONS.

As was to be expected in the circumstances, last week's annual gathering of the Society of Chemical Industry in Edinburgh—an account of such portions of the proceedings at which as were of special importance to our readers will be found elsewhere in this issue—was largely occupied with the consideration of questions bearing upon the industrial problems arising, and likely to arise, out of, and the commercial opportunities presented by, Germany's military aggression. Prominent in importance among these questions is, of course, the patent law; and this formed the subject of no less than three of the papers presented at the meeting. From what was stated by the authors, all of whom were eminently well fitted to speak authoritatively on the matter, it is evident that the patent law must be the object of further attention at the hands of legislators, if it is to prove generally acceptable to those who come in contact with it.

The author of one of the three papers was Mr. J. W. Gordon, K.C., who cited as the best example of the mischief to be remedied the well-known Levinstein case of 1883, the result of which, he said, was that a certain red dye much in vogue could not be manufactured at all in this country; the only dye-maker who was enabled by knowledge to produce it being disabled by law. Hence a large industry, the commercial value of which might be estimated in millions of pounds, was transferred from Lancashire to the Netherlands, "in order to vindicate the patent rights of a German firm in respect of an invention of which the intrinsic value was less than half-a-crown—indeed, a negative quantity." As a matter of fact, in the very year in which this action was tried an Amending Act was passed one of the clauses of which was designed to eradicate the mischief revealed; and subsequent Acts have also introduced changes in the law. But these alterations have, it was declared, one and all failed of their purpose; and in the result have scarcely modified the position at all. "Injunctions are still granted as freely as in 1883, and with equal disregard of consequences. The whole machinery of compulsory licensing and compulsory working has, with something like a maximum of effort, produced a minimum of result." After going into the whole matter thoroughly, the conclusion arrived at by Mr. Gordon is that the patent law could be easily reduced to an extremely simple form, in which the patent grant might be expected to produce a maximum of public advantage, by reducing the grant to a qualified monopoly which would in all cases confer upon the patentee the right to grant licences, but only in exceptional cases the right to restrain by an injunction the use of the invention. This reform the author placed before the Society as an urgent one; and he is further of opinion that, if carried out, it might be accompanied by a repeal of the intricate legislation and vexatious penalties of the last Patent Act.

Speaking as the Chairman of the Institute of Inventors, and also, of course, as a well-known chemist, Mr. Walter F. Reid contended, in his paper, that as a rule the inventor receives but a very small fraction of the wealth which he is instrumental in creating. Only 4 per cent. of the patents taken out are continued to the fourteenth year, and only 52 per cent. remain in force even at the end of the fourth year. "In return for an exorbitant fee," urged the author, inventors are granted a patent which, "contrary to popular belief, is not a monopoly at all, but merely a licence for litigation. The Government, having secured his money, renders the inventor no help should his rights be assailed, and leaves him to fight his own battles should anyone attempt to rob him of the fruits of his labour." In his opinion, it would be an excellent investment of public money to pay all a patentee's fees and expenses; and, even if this view be not to its full extent accepted, there will be a good deal of sympathy felt with the argument that, inasmuch as an inventor can derive no profit from a patent until it has been at work for a time, there is some hardship in adding to his difficulties at the beginning by heavy taxation. From the experience of the Institute of Inventors, Mr. Reid is able to assert that many valuable inventions are lost owing to the lack of means of men who are thoroughly familiar with their subject. In his opinion, "the whole management of the Patent Office should be re-organized. It should have at its head a man of the highest scientific and technical training, preferably one with some knowledge of English words and their meanings. If he has some experience of British industry, so much the better." Finally, he expressed approval of the action taken in various quarters to try and secure for patentees the option to suspend their patents until peace is declared.

The writer of the third paper was Mr. W. P. Thompson, a patent agent of long and varied experience, as well as being an inventor and patentee. He devoted himself to considering the disadvantages of the present patent law, of which he was able to point to a round half-dozen. In the first place, there is the fact that a vast number of patents suffer an untimely death through the heavy annual taxes which inventors often find it difficult to pay. In this connection, Mr. Thompson pointed out that in 1883, when the taxes on applications were lowered to about a fifth of their previous amount, the net income of the Patent Office was only very slightly reduced; and he is firmly convinced that, if the annual taxes were brought down to about £1 a year, the loss to the Government (if any) would be merely infinitesimal. In the next place, there are the heavy costs at present involved in fighting patent actions, which it was suggested would be obviated if (say) the chemists would combine to put all their patent cases to the arbitration of a special court of their own. He would like to see a better and more simple method in place of the existing unsatisfactory way of assessing costs and damages in these actions; and also the doing away with the opening which he says is left to fraud and useless expense by the prevailing system of provisional protection. In the next place, the author had something to say on the subject of the "uselessness, and, indeed, pernicious nature, of the compulsory working laws as at present existing;" and the final disadvantage to which he drew attention was the shortness of the duration of patents. It seems that Great Britain has, with the exception of a few smaller countries, the shortest duration of patents of any country. In Belgium, for instance, the term is twenty years; and inasmuch as it is found continually that a patent is just beginning to pay well near the end of the fourteen years, Mr. Thompson would like to see the term extended to (say) twenty years, which would put an end to the present costly procedure for extending the life of a patent usually for three to seven years.

Estimation of Naphthalene in Ammonia.

The naphthalene present in ammonia liquor can, it is stated in the American "Journal of Industrial and Engineering Chemistry," be estimated by the picric acid method in the following manner: A known quantity of the solution is cooled in ice-water, and neutralized by gradually adding sulphuric acid—cooling being maintained during the process. The liquid is then distilled, and about 30 c.c. of distillate collected. This is then extracted with ether, and the condenser washed out with a little ether. The ethereal extracts are treated with a N/20 solution of picric acid. After being allowed to stand for two minutes, the ether is evaporated under reduced pressure, and the residual solution cooled in ice-water and titrated with N/10 caustic soda solution, with litmus as indicator. Naphthalene is soluble in ammonia liquid containing 5 per cent. ammonia to the extent of 0·030 gramme per 1000 grammes of liquid, and in a solution containing 100 per cent. ammonia to the extent of 33 grammes per 1000 grammes solution. The solubility is increased if traces of pyridine are present. The distillation of ammonia liquor containing naphthalene results in blocking up the condenser tubes unless the temperature is kept above 30° C.

ELECTRICITY SUPPLY MEMORANDA.

A CONFESSION has been made by Mr. S. E. Fedden, the General Manager of the Sheffield Corporation electricity undertaking. The conditions justifying a similar confession reside in many other similar concerns; but there is not the candour to make it, such as Mr. Fedden has displayed. The Sheffield electricity undertaking is a considerable one, and is excellently situated in a wealthy industrial district. This beneficial circumstance notwithstanding, the General Manager admits to a feeling of grave anxiety both as regards the financial stability of the concern, and its ability to supply cheap units in the future, if the charges generally are so fixed as to yield a very small available surplus. While the undertaking is complying with legal requirements in respect of repayment of loans in the shape of sinking fund, capital indebtedness is not being reduced fast enough to keep the concern financially sound. In the opinion of Mr. Fedden, the department ought also to be able to put by enough money to bring the reserve fund up to 10 per cent. of the capital indebtedness, and to build up a strong renewals and special expenditure fund to deal with obsolescence. This fund, in his judgment, should not fall below £60,000, and should preferably amount to £100,000 on the present size of the undertaking. There are many electrical engineers who hold that the repayment of capital is equivalent to providing for depreciation. But here is Sheffield, legally, but not truly, fulfilling its duty in respect of repayments, with the plant at the Sheaf Street station entirely out of date; and yet, on present lines of repayment, it will take—mark this!—another twenty-three years to pay off the capital involved. Take the Kelham Island station, the plant is likewise out of date; but the sinking-fund repayment has to continue for another fourteen years. There is the Neepsend station, too, which was only opened in 1904. Already, when compared with the efficiency of the present-day plant, the first four turbines are obsolete; but the sinking fund repayments will not be extinguished till 1927. This all goes to prove that too long a period has been granted for the loan repayments.

A Confession from Sheffield.

It proves another thing, that—with repayment having been on inadequate lines, and without provision for reserve and renewals and special expenditure funds such as Mr. Fedden thinks necessary for financial stability—the charges for electricity have in the past been insufficient to allow the concern to show equal financial results, *plus* the provision of proper funds on the reasonable lines suggested. It also indicates that the consumers current and prospective, and the more economical plant, have to bear the results of the imprudence of the past, which is not a happy state of things, under actual and probable circumstances. Current conditions will be continued—though perhaps not in quite such burdensome degree—in the future. The costs of new capital, materials, labour, rates and taxes, and so forth will for many years be higher than in pre-war times; and, though there will be advantage from the more economical generating plant, on top of the heavier costs named will fall the burden of the insufficient past repayment and the provision of the funds dictated by wisdom. At the same time, manufacturers must be supplied with electrical energy at the lowest possible rates for power purposes, and particularly in Sheffield with gas at such cheap rate, and with private generating plants working at the efficiency now attained by them. Experience has made a wonderful difference in such plants, which do not trouble to charge a heavy price for lighting and a lower one for power. But the average price for all purposes, together with the reliability and the advantage of control over the plant, make investment in it a good one for the manufacturer and the owner of large business establishments who have preference for electricity for power and for lighting. All this shows the folly of those electric supply undertakings that have not so far made full provision for capital repayment coinciding with the life of the plant, as well as for the reserve, renewal, and special purposes funds. The penalty of omission is now being paid.

Past Neglect the Present Burden.

The "Electrician" has again raised the question as to whether the Government Departments that in these days exercise stern control over the capital spendings of statutory and other undertakings are altogether acting wisely in not allowing expenditure when it can be demonstrated that one result would be a permanent economy in coal, and thus a cheapening of output. There would no doubt be national advantage in this, if it were the easily arranged matter that simplicity considers it to be. There are considerations, such as that there is difficulty now in getting plant delivered and erected; and, even if the Departments in Whitehall were benevolently inclined, and allowed those stations with inefficient generating plant to commence spending money upon its replacement by higher efficiency plant, we doubt whether (at the rate contracts are being completed at the present time) the more economical equipment would, in the majority of cases, be established and at work this side of the termination of the war. If it could be, so that it had a sensible effect on the consumption of coal during the war, then it would be an excellent thing to realize immediately the fruits of the higher efficiency, but not otherwise. Another thing is that money is very dear just at present, so that any capital spent in these times means an additional higher cost in capital charges until the debt is liquidated. A further consideration is that plant does not all at once drop into arrear in the matter of efficiency; and there seems to be an immense amount of electrical plant to-day that takes a back place in this respect. It is true the war has been running about two years; but a period of two years is not a long one in the life of such plant. There is evidence here of the neglect of inefficient plant having long anteceded the war. However, on the point of coal economy, the electrical papers not long since called attention to the extensive variation in the efficiency of existing generating plants; and the uneconomy of coal consumption at Stoke-on-Trent was cited. There, the reported consumption of coal per unit generated ranged between 23 lbs. with modern plant at Stoke to as much as 21¼ lbs. at Longton. The figure at Burslem was 8 lbs.; at Hanley, 12 lbs.; and at Stoke (old plant), 13¾ lbs. These figures speak of waste. Now the "Electrician" gives another example—Bury, where there is a small 1500 KW. station, and a modern 7200 KW. station. In order to meet the demands, the older plant has had to be utilized, with the result that 2564 tons of fuel have been used by it during the past year, whereas the same quantity of electrical energy could have been generated by more modern plant with 1300 tons of fuel. In this one case alone, 1200 tons of coal have been immolated on the altar of inefficiency. How much more is sacrificed in the same way in the electricity supply industry is unknown; but the total quantity must be very considerable.

Loans or Coal Economy.

The dangers associated with the supply of electricity are freely acknowledged by the electrical industry—among themselves, but not to the public. The acknowledgment takes the form of regulations—some 125, for example, being of a self-inflicted order through the medium of the Institution of Electrical Engineers. Certain other influential bodies have their own forms of rules. So have the British Fire Offices, most of whom also accept compliance with the Institution of Electrical Engineers' rules as satisfying their requirements. Most other countries also have their official prescriptions for electrical work. But it seems very difficult to get the rules exactly right. Those issued by the Institution, for example, are constantly undergoing revision, though some praise and others revile them. Some say they are vitally necessary; others, that they are not. But the Institution and many other authorities say such and such must be the observances in order to ensure that electricity shall be as safe as it can be made. The subject is raised to the level of current interest by the issue of the second edition of a memorandum by the Electrical Inspector of Factories (Mr. G. Scott Ram), who deals with the regulations issued by the Home Office regarding the generation, transformation, distribution, and use of electrical energy on premises under the Factory Acts. Mr. Scott Ram ought to be very much pitied. His office is a very difficult one. Regulations are made, and nobody seems to understand them, or able to make them fit in with the conditions with which they have to deal. The Home Office realized the complexity of the conditions with which the regulations are concerned, especially when shoals of applications were received for detailed information as to what some of the crisply expressed decrees meant. So Mr. Scott Ram set to work, at the request of the Department, to explain matters in a lengthy memorandum. Still his first effort was not comprehensive enough. This is proved by various fresh points having since arisen; and explanations as to these are included in the second edition. There is abundant ground for reflection when one sees 32 regulations, some of only three or four lines each, requiring 74 pages (with half-a-dozen pages of appendices in addition) of closely printed matter to make their meaning intelligible to all concerned. We question whether the regulations are even now understandable by the layman responsible for the electrical work in their factories. It requires an electrically trained engineer to thoroughly absorb the thousand-and-one details. But the Home Office refuse to recognize or realize this. Their business is to make regulations, and to fix the onus of their observance upon persons who can be easily reached, and who, if they are ignorant of these matters themselves, must pay some competent person to look after them for them, though all responsibility for infraction still abides with the incompetent and not the employed competent person. Responsibility for the observance of the regulations, too, is not confined to the occupiers of premises. Mr. Scott Ram explains that "all persons engaged in any way in electrical work to which the regulations apply should make themselves acquainted with the regulations, as any person employed who fails to comply with them is liable to be prosecuted and fined. This responsibility is often overlooked by employees." Electricity purveyors should extensively circulate the regulations among factory and workshop owners and employees, in order to furnish them with some pleasant reading. They will find the word "danger" appears several times in the regulations and exemptions, and underlined.

Rules Testifying Danger.

As in the gas industry, so in the electricity supply industry, women are being given more responsible work to do. In the former industry their employment is not now limited to clerical, show room, meter and stove inspection,

Women in Electricity Stations.

and burner maintenance work, but they are taking part in laboratory operations. There are also amazons of the "gentler sex" engaged in such exhilarating work as brick unloading from trucks and coke loading into trucks. They find it good, healthy work, chest expanding and muscle hardening. The men will have to beware in more ways than one. At many electricity stations, women have also for some time now been engaged in the lighter work—clerical, showroom, meter inspection and reading, and in other ways. But they are being found capable of greater responsibility. In Glasgow, educated business women have been appointed as sub-station attendants, and are giving every satisfaction to Mr. W. Lackie, the Engineer and General Manager. He finds they only require about six weeks' training—three weeks at the head office, and three at the sub-station—to qualify them for the work. At the Port Dundas power station, women are taking the instrument readings and keeping records; while the cleaners at the sub-stations are entrusted with the renewal of the instrument charts. At Marylebone, in addition to the women employees for clerical and other work of a general character, girls are now being engaged for the switchboard galleries both at the generating and sub-stations. Under a lady district superintendent, women are also being employed as lamplighters, meter readers and testers, and in any other capacity in which they can fairly replace men. St. Pancras has had lady meter-readers at work for over a year. Women switchboard and sub-station attendants have also been employed by the Salford Corporation Electricity Committee and the Shropshire, Worcestershire, and Staffordshire Electric Power Company. These are examples of the place that women are taking in the electricity supply industry.

SIXTY YEARS AGO.

From the "Journal" for July, 1856.

The Anomalies of Scientific Evidence.—It is, indeed, lamentable to find, as happens almost daily, that seldom can any question requiring the aid of science for its elucidation be brought into our Courts of Law without developing from "the most celebrated professors" an array of hostile evidence, and an amount of counter-swearing absolutely disgraceful to the nation at large. . . . Many years ago, Mr. Hume, then acting as Chairman of a Parliamentary Committee of Inquiry into the means of detecting tobacco adulteration, addressed himself to a large conclave of scientific celebrities, by whom the Committee had been obfuscated for several days. "Gentlemen," said he, casting his eye down the detailed evidence, "this gives a very sorry account of chemistry." It has been our misfortune lately to witness another "sorry account," in the form of a series of affidavits, which, to be very guarded, we will call "aggravated exaggerations." According to some of these affidavits, ammonia, sulphurous acid, and sulphuretted hydrogen do not combine with or destroy each other when mingled together, as they are in the retort-house of a gas-works. On the contrary, though generated together, they leave the works singly and in the most perfect order. To them Lady Macbeth might in vain exclaim, "Stand not upon the order of your going, but go at once." They will do no such thing, according to the affidavits, but wing their way with all the symmetrical precision of a flight of wild ducks. First goes the Corypheus of destruction, the ammonia. This rises out of the roof of the retort-house, and, being naturally much lighter than the air, as well as accidentally much hotter, it ought to ascend, but by so doing would get out of the way of the affidavits. Therefore it falls immediately into a neighbouring garden, and destroys no end of cabbages! Next, it would appear that sulphurous acid and sulphuretted hydrogen make their exit, after the fashion of the Siamese twins or a "double cherry," "together but separate;" and these exterminate whatever the ammonia may have left—though it is well known, and a maker of one of the affidavits has even published the fact, that "sulphurous acid and sulphuretted hydrogen mutually decompose each other, with the production of water and free sulphur!" The air which issues from the retort-house has an average temperature of 120° Fahr., and has never been known to exceed 175°. Yet in one of the affidavits it is sworn that certain trees, standing at least 80 feet from the point where the air issues, are "charred and burnt," though dry wood does not begin to char, or even to turn brown, till heated to more than 300° Fahr.! One affidavit not only asserts that sulphate of ammonia and free sulphuric acid can exist together, but that they have been thus found existing together in the "bark and leaves" of certain "trees!" Another, that there is no sulphuretted hydrogen in the smoke of "a common chimney!" But we might go on *ad infinitum* with these scientific paradoxes.

Gas for Refrigeration Purposes.

Refrigeration is the subject specially dealt with in the July issue of "A Thousand-and-One Uses for Gas," published by the British Commercial Gas Association. The apparatus described and illustrated is that patented by the Auto-Vacuum Refrigerating Company, Limited. It is a method of producing dry air for artificial refrigeration by means of ammonia absorption; and one of the most important features of the plant is the entire absence of any motive power other than the row of gas-burners beneath the cylinders.

EXAMINATIONS IN "GAS ENGINEERING," "GAS SUPPLY," AND "GAS-FITTING."

Some Further Successful Candidates—See ante, p. 111.

GAS ENGINEERING.

Final Grade:

First Class:

Brown, H. H.
Dean, H. W.

Second Class:

Allan, O.
Berry, S. N.
Cæsar, J. E. V.
Hems, H. H.
Hyde, J.
Nicholls, C.
Stanton, L. V.
Tradewell, C. C.
Wynne, H.

Grade I.:

First Class:

Gabbatt, W. M.
Holliday, H.
Jackson, F. J.

Second Class:

Barber, P.
Bavin, W.
Buttery, G. G.
Green, W.
Pickering, E. T.
Prince, R.
Stainiforth, F.

GAS SUPPLY.

Final Grade:

First Class:

Belton, F. W. J.
Clarke, H. W.
Cornish jun., J. H.
Eady, L. H.

Grade I.:

First Class:

Jones, A. B.
Reed, W. H.

Second Class:

Sida, W. W.

GAS-FITTING.

Final Grade:

First Class:

Akerman, E. J.
Halbert, A. W.

Grade I.:

First Class:

Herbert, W. C.

Grade II.:

First Class:

Beer, W. C.
Biggins, W. G.
Charles, F. E. B.
Irvine, H.
Lea, C.
Stockwell, H.
Wise, S. J.
Yeoman, W. G.

Winners of the Society of British Gas Industries' Prizes in the Recent Examinations.

The Secretary of the Society (Mr. Arthur L. Griffith) forwards a list of winners of the prizes given by the Society in the City and Guilds of London Institute's recent examinations in "Gas Engineering," "Gas Supply," and "Gas-Fitting" (Honours Grades).

Gas Engineering.

First Prize, Final Examination £3 3s.	Herbert H. Brown, 207, Manor Farm Road, Bitterne Park, Southampton. Examined at University College, Southampton.

The second highest candidate is a teacher, and therefore not eligible.

Gas Supply.

First Prize, Final Examination £3 3s.	Harry William Clarke, 71, Clovelly Road, Southampton. Examined at University College, Southampton.
Second Prize, Final Examination £2 2s.	Francis William James Belton, Lower Beech Farm, Beech Lane, Tythington, Macclesfield. Examined at Manchester Municipal School of Technology.

Gas Fitting.

First Prize, Final Examination £3 3s.	Charles Donald Walker, 18, Basuto Road, Fulham, S.W. Examined at L.C.C. Westminster Technical Institute.
Second Prize, Final Examination.	Frederick William Webb, 8, Petworth Street, Bridge Road, Battersea, S.W. Examined at L.C.C. Westminster Technical Institute.
Equal, £1 1s. each.	Arthur Wyndham Halbert, 58, Merches Gardens, Cardiff. Examined at Cardiff Technical College.

Japanese Chemicals.—The Japanese Home Office has, says the "London and China Telegraph," been encouraging the production of chemicals and drugs in Japan, in order to make up the shortage in imports of these goods resulting from the European war. As the result of a recent official investigation, it is stated that numerous chemicals and drugs are now being produced in Japan; and the scientific process of making synthetic dyes is being studied. The total quantity of sulphate of ammonia which will be manufactured in Japan this year is stated to be 41,800 tons. It is estimated that the Japanese demand for oxygen for industrial purposes can be nearly satisfied by the output of the Japanese companies, which is said to amount to about 2 million cubic feet per annum.

MIDLAND ASSOCIATION OF GAS ENGINEERS AND MANAGERS.

The Benzol and Toluol Plant at Etruria.

Accompanied by their President (Mr. Charles H. Webb, M.Sc., Assoc.M.Inst.C.E., of Stourbridge) and the Hon. Secretary (Mr. W. G. S. Cranmer, of Willenhall), a large party of members journeyed to Etruria, Stoke-on-Trent, last Thursday, in response to an invitation of the Directors of the British Gaslight Company, Limited—conveyed to them by their Engineer and Manager at the Potteries station, Mr. Harold E. Copp.

On arrival, shortly before noon, a tour of the works was made, under the direction of Mr. Copp and his assistants—starting with the retort-house, and proceeding to the station meter-house (where a welcome halt for light refreshments was called), the governor house, laboratory, engine-house, scrubber-house, and, finally, the crude benzol recovery plant, which naturally demanded and received most particular attention. Here Mr. Copp was assisted in his demonstration of the working of the plant by Mr. F. L. Halford and Mr. W. Doig Gibb, who had by this time joined the party.

Mr. Copp kindly supplied the following

DESCRIPTION OF THE CRUDE BENZOL RECOVERY PLANT.

The plant was manufactured and erected by the Chemical Engineering Company, of Hendon, and designed for the treatment of 10,000 gallons of green oil per diem. The contractor for the foundations was Mr. Thomas Godwin, of Hanley. The subsoil being of an unsatisfactory nature, the foundations are carried on a reinforced concrete raft.

The scrubber house contains two Pelouze and Audouin tar-extractors, which can be used either in parallel or series. The gas then passes through the Holmes washer-scrubber, through the first portion of which liquor is circulated—clean water being introduced in the last section.

The gas then passes to a second Holmes's washer, through which green tar oil (debenzolized) is circulated at the rate of about 75 gallons per ton of coal carbonized.

The benzolized oil gravitates thence to the storage tank, and is subsequently pumped through the debenzolizing plant. The delivery from the pump enters the first of the preheaters, thence through the second and the two superheaters to the still. The overflow (debenzolized oil) from the still passes in the reverse direction through the two preheaters, thence through the coolers by gravitation to its storage tank.

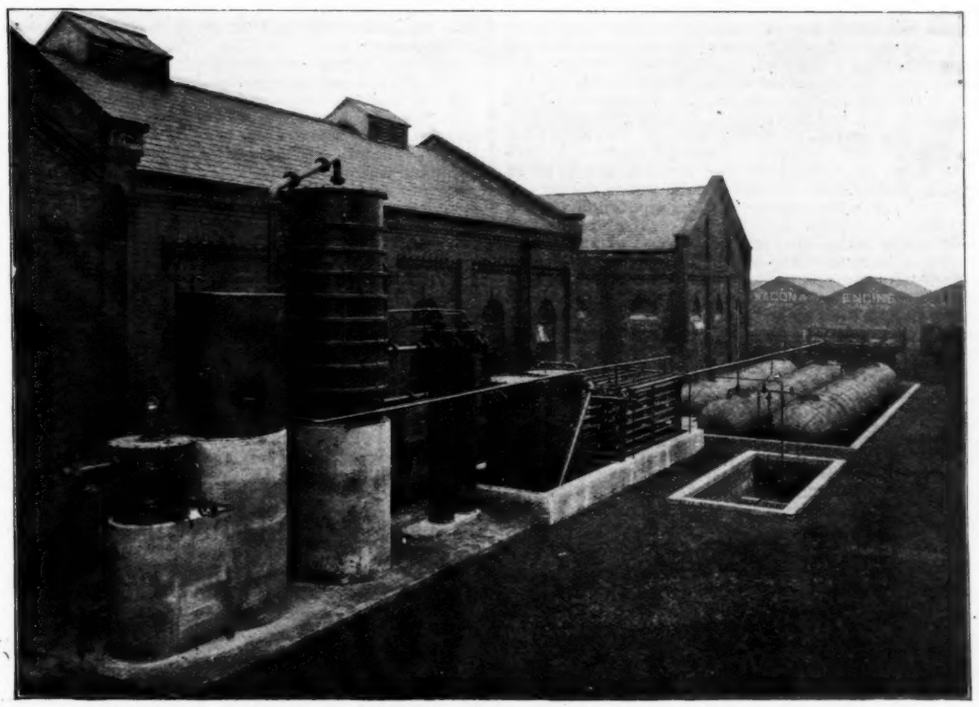
The water and benzol are separated at the outlet of the plant; the former gravitating to the liquor well, and the latter to the crude benzol storage tank, from which it is loaded into railway tank waggons by means of compressed air.

Experience has shown that it is essential that the still be maintained constantly at the required temperature; for if the temperature is permitted to drop unduly, debenzolization will not be properly effected, and the oil will tend to become emulsified—thus rendering it useless for further circulation.

It is also important that the temperature of the wash oil should be kept low, in order to facilitate the absorption of benzol. Steps have, therefore, been taken to get the water temperature as low as possible. The whole of the water from the condenser, coolers, and still is collected and run through a series of channels underneath the storage tanks for cooling purposes. It then passes through a filter to the suction tank, over which water is sprayed, to further assist in the reduction of the temperature. Water is also sprayed on to the pipe conveying the debenzolized oil to its storage tank. The surplus water, running down the surface of the latter, by evaporation assists in keeping the contents cool.

In present circumstances, it is not, of course, permissible to indicate even the scores of pertinent questions which were addressed to the "powers that be," and answered more or less fully; nor must anything be said as to the items of interest regarding the supply of high explosives which were welcome news to everyone present.

After an hour and more had thus been spent, an adjournment was made to the work's mess-room. Here luncheon was served to close upon a hundred guests—members of the Association and local gentlemen (among whom was the Mayor of Stoke, Mr. J. S. Goddard), many of whom were connected with the Federated District Council. Mr. Copp was at the head of the tables, as a very efficient representative of his Company. He was supported by Mr. Halford and Mr. Gibb, as also by Mr. S. E. Whitehead, of the Ministry of Munitions, and Messrs. John Bond, George Wilton, of the Chemical Engineering Company, Percy Cox, Isaac Carr, and S. Meunier. There were also some sixty members of the Association, with, of course, Mr. Webb, as President, on the Chairman's left hand.



THE TOLUOL PLANT AT THE ETRURIA WORKS OF THE BRITISH GASLIGHT COMPANY.

The Toast List.

After the toast of "The King" had been duly honoured,

Mr. Copp said that, on behalf of the Directors of the British Gaslight Company, he extended a very cordial welcome to those present. They were honoured by the attendance of the President and Hon. Secretary of the Midland Association, Mr. Halford and Mr. Doig-Gibb, of the Ministry of Munitions, and also the Mayor of Stoke-on-Trent. The reason that he (Mr. Copp) was in the position of Chairman that day was because his Directors were visiting their Hull station; and Mr. Young, therefore, was unable to be with them. They also regretted the absence of Mr. J. R. Heath, the designer and former Engineer of the Etruria works. Referring to the new plant that had been inspected that morning, Mr. Copp said that some months ago the late Sir Corbet Woodall intimated to him that the British Gaslight Company

ought to go in for benzol extraction, because benzol and toluol were very much needed by the Government for the proper conduct of the war. Their importance had been amply demonstrated by the fact that recently the fortunes of England in the war had improved very rapidly. The merest expression of a wish was quite sufficient for him (Mr. Copp); and he at once submitted a report to his Directors and received immediate instructions to instal a plant. The result they had seen that day. It was unnecessary for him to go into details as to the construction of the plant; for this had no doubt been clearly observed by all during the inspection. Mr. Halford would no doubt emphasize the great necessity for the production of benzol and toluol. Now, the first thing which gas engineers would consider in connection with this would be what was the effect on the illuminating power and calorific value of their gas. The first he did not want to say much about. The production of benzol and toluol was a national necessity; and they knew Parliament had taken steps to relieve those who were prepared to instal the needful plant of their obligations with respect to illuminating power—a very right and proper course. With regard to calorific value, he could assure them the reduction was almost infinitesimal. The last aspect of the question was one which appealed to gas managers more than anything else. It was the very alpha and omega of gas engineers—what were the financial results? He would make no remarks about the financial side of the question except to reiterate what he had said—that the production of benzol and toluol was a national necessity. He could assure them all, in conclusion, that the extraction of benzol and toluol was not likely to hurt them at the present moment and certainly not after the cessation of the war.

Mr. Halford was quite sure he was voicing the sentiments of all present when he thanked Mr. Copp and the British Gaslight Company for their enjoyable hospitality. He did not propose to make any particular remarks about the new plant; for of that they could judge for themselves. Mr. Copp and his Company had done their best; and not only so, they had done all in their power to induce others to do likewise. The visit to the plant had been to him, personally, a very great treat. As they would understand, for very many months he had done little else but talk, write, and not infrequently dream about benzol and toluol; and therefore to visit a works actually producing the crude spirit was a very pleasant interlude. He felt it was no use attempting to say anything new on a subject with which most of those present were all so thoroughly conversant; but there were some things that could not be repeated too often or emphasized too much. Just as it was right to urge the public not to use motor-cars for pleasure purposes and dress with patriotic shabbiness, it was equally right that he should offer no apology for referring at a meeting of gas engineers to the urgency for he production of a considerable and ever-increasing quantity of benzolt and toluol. How urgent the demand was they would be able to judge for themselves when they considered what had happened during the past few weeks. Never was the necessity for the production of high explosives more urgent. It was no secret that the expenditure of shells had far exceeded the most exaggerated estimate of those who rated it in the first place. It was clear everything must still be speeded-up. More shells must be produced and the raw materials must be forthcoming to fill them. They had all seen that day what could be done to assist in this direction. Mr. Copp was one of the earliest to come forward; and his plant was now of very real material value. He could not hope to influence those of them who had not yet decided to move in the matter; but perhaps the exercise of their imaginations would. No doubt all of them had friends in France and at other fronts. Let them think of them now, and think of what they were doing, and of the power they had to assist them. England seemed now to have reached the most crucial moments of the war. The whole weight of the reserves of the country must be brought to bear; and any man who failed to help the men in the field was failing in his duty to the country in its hour of need.

Mr. Webb (as President of the Association) proposed that the best thanks of the members be given to the Directors of the British Gaslight Company and also to their Engineer (Mr. Copp) for affording them the opportunity of seeing the benzol and toluol plant and incidentally the works themselves. The Directors of the Company had acted in a very patriotic manner, because they did not know what the financial results might be over a long period of years. They simply came to the conclusion that the benzol plant had to be installed; and they left it to their Engineer to do the work. Mr. Copp had carried out the work to the limit of thoroughness. He would like to assure Mr. Halford that it was the desire of every member of the Association to do all he could for the ends that they had in view. There was only a little difficulty, not so much perhaps a technical difficulty—most of them felt they had overcome that—but a financial difficulty, and in some cases the subjects of calorific value and illuminatiug power would have to be considered. Every man had to solve these difficulties for himself; and he had no doubt they would all do so as quickly as possible. In addition to seeing the new plant, they had enjoyed inspecting the works, which, as gas-works purely and simply, ranked among the finest it had been his privilege to see. He had the greatest pleasure in proposing the resolution.

Mr. Samuel Glover, in seconding the resolution, said the British Gaslight Company were certainly showing them the way in the matter of benzol and toluol recovery. The engineers all through the country were anxious to do all they could; it was only a matter of time to educate their authorities to overcome the different difficulties which presented themselves. The process in question was so necessary that he hoped many more plants would be laid down; and that in some cases they would be even more extensive than the one at the Etruria works.

Mr. Copp thanked the visitors for their kind expression of thanks. The object of his Directors in inviting the members of the Association was, he said, to emphasize the importance and necessity of benzol and toluol production at the present time. He went on to say that they were favoured by the presence of the Mayor of Stoke-on-Trent that day, and he was sure the members would most heartily drink to his health.

The toast having been honoured,

The Mayor said that, personally, he did not profess to know anything at all about benzol and toluol; but he felt that this visit to the Etruria works must have done a great deal of good from a national point of view. He was very much struck with the few remarks made by Mr. Halford. He thought all of them were imbued with the same spirit and desire to do all that lay in their power to help the men who were now fighting their battles in France and elsewhere. He was perfectly certain that the result of the present gathering would be of very material benefit to the Government of the country.

Subsequently the party was assembled on one of the well-kept grass plots on the works which form such a pleasant contrast to the surroundings of the district, but are in excellent keeping with the whole of the buildings and plant on the works themselves. Here a series of photographic groups was taken, as a memento of the interesting chapter in the history of the Association.

The latter part of the day was occupied—by some of the members visiting the Company's well-arranged show-rooms in Broad Street, and by others in an inspection of Messrs. Wedgwood and Sons' Pottery Works.

GERMAN ASSOCIATION OF GAS AND WATER ENGINEERS.

ANNUAL REPORT.

The following is a summary of the contents of the report for the past year of the Council ot the German Association, as presented at the Fifty-Seventh Annual Meeting, which was held in Berlin on the 28th of June last.

As the second year of the war nears it close, it is gratifying to note that with very few exceptions the supply of gas and water to German towns has pursued a normal, or even an unexpectedly favourable, course. Thanks to the sympathetic attitude of the highest military and civil authorities, the difficulties inseparable from a state of war were met, and the future can be regarded also with great confidence. Special thanks are dûe to Herr Lempelius, Herr Körting, and Dr. Bueb for their efforts on behalf of the German gas industry in this difficult time. In this connection, mention need now be made only of the coal supply of gas and water works, the utilization of bye-products for war purposes, the reinstatement of indispensable assistants, the employment of disabled soldiers and prisoners of war, the provision of courses of instruction for fitters in prisoners' camps, and the adoption of a uniform price for gas, whatever the use to which it is put. In furthering these and other matters, the Association have found ample scope for their activities during the past year.

Munich Gas Exhibition.

A comprehensive and well illustrated report on the Munich Gas Exhibition of 1914 has been published in the course of the year in the "Journal für Gasbeleuchtung;" and the articles are now being collected for publication as a volume for issue to members of the Association. This may prove especially useful to those who were unable (owing to the sudden closing-down of the exhibition) to visit it.

Gas and Hygiene.

The Council contemplated re-publishing the lecture of Professor von Gruber, of Munich, on "Gas and Hygiene" [see "Journal," Vol. CXXXI., pp. 449, 510], in order to counteract the views which are still widely held as to the harmfulness of gas lighting. He has, however, informed them that he is making further investigations on the question, and is, moreover, of opinion that this is not a good time for propaganda. The matter has, therfore, been held over for a time. It will be remembered that the Bunsen-Pettenkofer Award of Honour was conferred at the last annual meeting on Professor von Gruber, who has since acknowledged its receipt in terms expressive of his appreciation of the honour conferred on him, and of the great work for the public welfare which the members of the Association are engaged in.

Heating and Cooking Apparatus.

The Council and the members of the former Committee on Heating have considered the revision of the instructions issued by the Association for the "Installation and Manipulation of Gas Heating and Cooking Apparatus." They had the assistance of representatives of makers of this class of apparatus. It was considered desirable to introduce some modifications of the former instructions, especially in regard to the removal of flue gases and the connection of apparatus to chimneys. A memorial from Bavarian pottery and stove makers drew attention to the building laws in Munich and other towns in Bavaria, and to the necessity for precautions against the escape of flue gases through down-draught when a gas-fire was connected to a chimney which served also for stoves that consumed solid fuel. The Council ultimately adopted—at its meeting on May 27 last—a revised set of instructions for the installation, fitting, and manipulation of gas heating

and cooking apparatus for domestic purposes. These instructions are printed as an appendix to the report, and are recommended for acceptance by the general meeting. All the points brought to the notice of the Council have been considered, and as far as may be dealt with in this revised set of instructions. Herr Ries and Dr. Schilling have undertaken to represent the Association with a view to obtaining such revision of the building laws of Munich as will put them in accord with the revised set of instructions. It was decided that domestic heating apparatus only should be dealt with, as the great variety in technical heating apparatus, and the methods of using it, rendered it difficult to compile a set of instructions generally applicable to such apparatus, in which each individual case required special consideration.

Report on "Tubes."

The Special Committee appointed to report on "Tubes" have issued a circular letter of inquiry to gas and water works in regard to their use of cast-iron, wrought-iron, and steel pipes, and have thus received a great deal of valuable information. Detailed replies were sent by 162 undertakings, representing 126 town gas distributing systems and 117 town water supplies. The total length of main covered by these reports was 11,490 miles for gas, and 9315 miles for water supply. The data have been collated for the Committee by Herr Hase, of Lubeck, and Herr Kümmel, of Charlottenburg, and their summary is printed as an appendix to the annual report. It merely presents the facts ascertained, and a critical examination of them will be undertaken by the Committee in the ensuing year. Further information will be welcomed by the Committee.

Standard Length of Pipes.

The deliberations with the Cast-Iron Pipe-Makers' Federation and the Association of German Engineers in regard to standard lengths of cast-iron pipes, which were referred to in the report for 1914, have not been pursued further. Both this matter, and the discussion of the question of uniformity of outside diameter for cast-iron, wrought-iron, and steel pipes, as well as that of the signs and colours to be adopted in plans of distributing systems, have been held over until the end of the war.

Electrolysis.

The petition, which the Association have presented to the Prussian Government, praying for the adoption of its "Prescriptions" for the protection of gas and water mains from the vagrant currents from direct current tramway systems in which the rails are used as conductors, has not yet been attended to, and an answer must still be awaited with patience. Meantime, a Postal Administration, whose system has suffered injury from vagrant currents, has applied to the Association for guidance.

Instructional and Experimental Gas-Works.

Dr. Karl Bunte, the Director, and the whole of the staff of this works, having been called up for military service, the works have been closed and the erection of extensions discontinued. The current experimental work has been carried out in the laboratory of the Chemico-Technical College at Carlsruhe under the supervision of Professor H. Bunte, and in the Testing and Experimental Works of the Duchy of Baden at the Technical College, under Professor P. Eitner. Dr. Terres, the Chief Assistant at the Chemico-Technical Institute, has taken over the general business administration, and has undertaken the difficult and responsible task of carrying out efficiency and delivery trials on the new installations of carbonizing plant at Erfurt, Augsburg, Heidelberg, and Brunswick. Apart from special reports on asphalt, cyanogen sludge, meter liquids, meter deposits, &c., 229 tests were made on samples of coal, coke, liquor, oxide, gas, washing oil, tar, and boiler feed water. Of these tests, over half were on samples of coal and coke, of which many were sent for report in the earlier days of the war, when new varieties of coal were being supplied as gas coal.

More important scientific studies and tests in connection with topical questions cannot be reported upon at the present time. These questions include the extraction of benzene and its homologues from coal gas by washing, the calorific value of the debenzolized gas, and its rate of ignition, the lighting value and air requirements in the burners in use for lighting and heating purposes, the use of compressed coal gas for railway carriage lighting, and the effect of the compression on the deposition of oils, its calorific value, its specific gravity, and lighting value. Two series of investigations have been undertaken by Herr Knickenberg on the effect of pre-heating on the light produced by inverted gas-burners of different types and power, and on the course of flow of the secondary air supply to such burners. A number of questions addressed to the experimental works were answered by reference to the information already accumulated.

The holiday course of instruction for gas engineers, which has been given regularly since 1898, and has been well attended, was not held in the past year, partly on account of the small number presenting themselves as students, and partly because of the dearth of instructors. The intending students have been informed that it is hoped to hold the course next year.

The extensions of the instructional and experimental works had been completed with the funds in hand so far as the skeleton of the building was concerned. The finish and equipment of the interior have been deferred until the war is over, when it is hoped that the director of the works and his assistants will have returned safely from the field of battle. The funds collected for the completion of this work have meantime been partly invested in the (German) War Loan, in order that they may earn interest.

Photometric Committee.

The Photometric Committee, which consists of Dr. Eitner, Dr. K. Bunte, Professor Drehschmidt, Dr. Krüss, and Dr. Liebenthal, have progressed with the preparation of "Rules for the Photometry of Lighting Gas," and have drafted rules practically ready for consideration; but as the (German) Illuminating Engineering Society have suspended their work since the beginning of the war, and their co-operation in this work is desirable, the matter has gone no further. The question of the simplification or unification of dimensions of burner parts will be taken up again at the end of the war.

The Association have disposed of the whole of their stock of standard paraffin candles, and the works entrusted with their manufacture cannot at present give a further supply, owing to difficulty in obtaining cotton wick of the required quality and the high price of paraffin.

Price of Gas-Mantles.

Owing to the repeated increases in the price of mantles, the Council of the Association have asked the firms concerned for explanations, and have received exhaustive replies dealing with the position of the industry and the conditions which affect prices and are responsible for the present enhancement. These communications indicate that the supply of mantles is assured for some time to come, and no further rise in price need be anticipated unless quite unexpected conditions ensue.

Statistics.

The thirty-sixth annual compilation of "Gas Statistics," relating to the year 1914, gives particulars of 385 gas undertakings, as compared with 394 in the previous issue. The falling off is partly due to the omission of certain works in districts in the occupation of, or exposed to attack by, the enemy. The greater number of the works note a reduction in the output of gas.

The death has been reported, since the last annual report was issued, of ten members of the Association. The membership roll has eighteen fewer names than at the close of the previous year. It now comprises five honorary members, 875 ordinary members (of which 448 are companies or municipalities in their corporate capacity), and 181 associate members (commercial firms, &c.), making a total of 1061 members of all classes.

District Associations.

Reports have been received from the eight affiliated District Associations, from which the following particulars are taken.

The Brandenburg Association of Gas, Electricity, and Water Engineers held its thirty-seventh annual meeting at Berlin on March 25 to 27. Though the programme had been shortened on account of the war, the attendance at the meeting was no smaller than in times of peace. The chief feature in the programme was a discussion on "Gas, Electricity, and Water Works in Wartime," which was opened by Herr Lempelius, who gave a lecture, in which he referred to coal supply, sale of bye-products, labour conditions, and the embargo on metals, and the part played by the Central Publicity Bureau (of which he is the Manager), in connection therewith. Herr Anklam, retired Manager of the Water-Works at Friedrichshafen, near Berlin, and Herr Arthur Müller, retired Manager of the Charlottenburg Gas-Works, were elected honorary members of the Association. Herr Pohmer, Manager of the Mariendorf Gas-Works at Berlin, was elected to succeed Herr Kümmel as President of the Association. There were four honorary members and 185 ordinary members on the roll at the end of the year—being an increase of one in the total membership during the year.

The Mid-Rhenish Association of Gas and Water Engineers, in view of the pressure on the time of gas managers, did not hold a general meeting during the past twelve months. The Association, of which Herr F. Göhrum, Manager of the Stuttgart Gas-Works, is President, numbered 247 members of all classes at the close of the year, compared with 270 twelve months earlier.

The Association of Gas and Water Engineers of Silesia and Lusatia contemplated dispensing with a general meeting during the year; but at the request of forty members, a special meeting was held in Breslau on September 25 last, and was attended by 49 members. An address was given by Herr Wilhelm, of Zittau, on "War Measures in Gas-Works," and a lively discussion of it took place. Dr. Erlenbach, of the Commercial Association of German Gas-Works, the headquarters of which is Cologne, presented a communication on the "Market Position of Coke, Tar, Ammonia, Retort Carbon, and Spent Oxide." Various other topics were discussed, including the employment of prisoners of war on gas-works. The meeting decided to invest 4000 marks (about £200) of the Association's funds in the German war loan, and to give 500 marks (about £25) to the Red Cross fund.

The Association of Gas, Electricity, and Water Engineers of the Rhine District and Westphalia held a meeting on Feb. 26 at Cologne, which was well attended. Herr Ohly, the Manager of the Commercial Association of German Gas-Works, gave an address, in which he enlarged on the "Importance of the Bye-Products of the Gas Industry at the Present Time." Herr Lenze, of Bochum, was chosen President for the ensuing year. At the close of the financial year, the Association had four honorary members, 263 ordinary members, and 121 associates.

The Bavarian Association of Gas and Water Engineers held a meeting on May 6 last at Augsburg. Herr Tillmetz, of Fürth,

described measures which were adopted there for meeting war conditions, which included, for the duration of the war, an uninterrupted working time of nine hours for both the indoor and outdoor staff of the gas-works. Provision was made for feeding the workpeople during this long shift.

Dr. E. Schilling, of Munich, gave a historical review of the new gas-works at Augsburg, for the scheme of which he was responsible. Herr Kreis, the Manager of the Augsburg Gas-Works, gave an account of the working of the new Pintsch-Bolz carbonizing chambers. Herr Puchalla, of the Isaria Works, reported on the effect of the metal embargo on the manufacture of gas-meters, and the changes it had rendered necessary in methods, and the metals which had been substituted for those unobtainable. Herr Lempelius, the Manager of the Central Gas Publicity Bureau, described the measures which the Bureau, in conjunction with the parent German Association, had taken to meet the difficulties which the state of war had imposed on gas, electricity, and water works. Herr Ohly also read a paper on the "Effect of the War on the Commercial Development of Gas Undertakings." The members spent the afternoon in a visit of inspection of the new gas-works of the Corporation of Augsburg, situate at Oberhausen.

The Baltic Association of Gas and Water Engineers held its forty-third annual meeting on June 30, 1915, at Berlin, under the Presidency of Herr Handke, of Stolp, but only formal business was transacted. The Association comprises 177 members of all classes.

The Association of Gas and Water Engineers of Saxony and Thuringia, held its sixty-third general meeting at Dresden on May 13 last, under the presidency of Herr Schäl. Herr Ohly read a paper entitled, "Coal, the Source of the Most Important Raw Materials in War and Peace." Herr Jäckel presented a report of a Committee on the "Distribution of Gas to Long Distances." There was an informal discussion on "Gas and Water Topics." in which naturally the influence of the war on the gas industry claimed the greatest share of attention. In the course of this discussion, Herr Fritzsch described a tar distilling plant which his firm (Opitz and Klotz) had erected at the Zwickau Gas-Works, and the results obtained with it. It transpired that the distillates (particularly the fuel oil) had to be placed wholly at the service of the German Navy, and had in fact been taken by it. Herr Voss, of Quedlinburg, was elected President for the ensuing year, when the general meeting will be held at Halberstadt.

The Association of Gas and Water Engineers of Lower Saxony decided not to hold a general meeting in 1915 in view of the war, and no change has been made in the officers.

THE NATURAL GAS ASSOCIATION OF AMERICA.

THE extracts from the proceedings of the Natural Gas Association given below present some idea of the magnitude of this industry, and of the value of it as a national asset. The supply amounts to some three or four times the entire output of Great Britain; and the large quantity of paraffin hydrocarbons available would appear to offer an excellent substitute for benzol and toluol extracted from artificial illuminating gas.

The proceedings of the Association at the eleventh annual convention recently held at Pittsburgh are interesting, seeing that the natural gas industry of America is at present in some respects similarly situated to the British gas industry. Although they have in addition several State Associations, they feel the need for a more authoritative and influential representation than now exists. They are also giving much attention to the conservation of their product, and to the extraction of light oils from it.

An Adequate Representation.

The convention comprised a three days' session, and an extensive exhibition of appliances, confined to manufacturers who are members of the Association, which proved an inconvenient counter attraction to the technical proceedings. A special Committee formed in January last, under the title of "The Ways and Means Committee for Increasing the Scope, Usefulness, and Efficiency of the Natural Gas Association of America," reported in favour of the establishment of permanent headquarters under the charge of a full-time officer, and that the Association should constitute a business bureau for the entire industry, to attend to, and keep track with, legal advice, commissions and general legislation, individual assistance, &c. The scheme would involve a cost of about $25,000 per annum. The present annual income derived from the subscriptions of members was only $4000; but the Committee were assured of sufficient support from individual companies.

Mr. W. Y. Cartwright, of Clarksburg, West Virginia, was the President; and the proposition formed the chief feature of his address, from which many of the customary topics were conspicuously absent. He said that Pennsylvania was the birthplace of their industry, and that Pennsylvanians were largely concerned in its development and progress during the last thirty years. The place in which they were meeting represented the greatest gas consuming district in the world; and its prosperity was chiefly due to the use that it had made of natural gas. The past year had been prosperous for the industry generally, and also for the Association. They had beaten the record in the matter of increase of members. Including about 100 applications received during the meeting, the total for the year was over 400, and brought the membership up to 1200. He thought, however, that the increase should be greater, and that the Association had not kept abreast with the growth of the industry. When they organized eleven years ago, the Association represented about 50 millions investment, and a few hundred thousand consumers; but to-day, these figures had increased tenfold.

In strongly urging the acceptance of the Ways and Means Committee report, he remarked that members who had not served as Directors or on Committees were not aware of the constant requests for assistance received from operating companies for data to be used in connection with franchise matters before city councils, rate hearings before public utility commissioners, and relative to legal questions. A strong central representation was the more necessary on account of the universal establishment of state utility commissions; and he pressed for prompt and definite action on the lines indicated. He had suggested that companies should be accepted as members on payment of a levy proportioned to their income; and he hoped that sufficient funds would be forthcoming to admit of a permanent office in Pittsburgh, a whole-time secretary, and a monthly bulletin, and to affiliate and co-operate with the State Associations, of which he might mention the West Virginia (barely a year old, but comprising 2500 members), the Indiana, and the Pennsylvania and Ohio Associations now in course of formation. The report was subsequently adopted.

Conservation of Natural Gas.

Dr. Van H. Manning, of the United States Bureau of Mines, described the work done under the auspices of the Government, and estimated that the quantity of natural gas that was wasted was sufficient to supply the domestic needs of a population of 8,000,000 for a year. Much of this was due to the lack of means for confining or utilizing the gas at the wells. Sometimes it was allowed to escape until the pressure was so far reduced as to admit of the casing being capped. At first, the gas was considered objectionable, and no attempt made to save it; but with the construction of long pipe-lines, and the help of the State laws, much of it was now utilized. The filling of a well with mud resulted in sealing any porous strata above the natural gas sands, and prevented the escape of gas into it. The plan was successful, and had been extensively adopted. The mud was in the drill hole while drilling, and acted as a packing round the casing, it reduced the amount of casing required, protected it from the action of corrosive waters, secured greater safety for the operators, and the assurance that excessive pressure would not prevent the completion of the well, quite apart from the value of the gas conserved. The author referred to the work done in various States by the co-operation of producing and marketing companies, such as the holding of hearings and the issue of regulations, and recommended that all gas-yielding strata should be sealed as encountered, that each string of casing should be sealed and tested, and that the space behind the casing, in a gas-bearing stratum, should always be full of mud. An efficient valve should be placed on the top of the inner string of casing when drilling into a possible gas-yielding sand, the string of casing through which the gas is taken should be situated on the top of the gas sand, and the gas should be prevented from coming in contact with the wall of the boring. When oil and gas issued from the same boring, they should be separated and kept apart by means of a trap; and many of these were in common use. The marketing companies should become common purchasers, and buy ratably from all producers. He instanced the work done in the State of Oklahoma as worthy of consideration when drafting laws or regulations.

Professor White, the Chairman of the Committee on Conservation, said that the author of the movement was Mr. Holmes, and that it took active shape with the appointment of a Commission by President Roosevelt. After going at length into historical detail, he said that it was only recently that the advice of geologists had been considered in connection with the investment of capital in the natural gas field. The anticlinal theory, at first ridiculed, was now regarded seriously, and largely governed new extensions.

The President remarked that the Association would be glad to co-operate with State Commissions, and added that in the past the local companies had been kept busy by efforts to save their property from legislative confiscation.

Mr. M'Dowell said that the value of the work done by the Bureau of Mines, in connection with the State utilities of Oklahoma, could not be over-estimated. The regulations had been recognized as just, and were quite commonly adopted in contracts

Extraction of Gasolene from Natural Gas.

Messrs. Burrell, Biddison, and Oberfell submitted a long paper, replete with figures and statistics, entitled "Gasolene from Natural Gas by Absorption Methods." The process is quite different from the compression and condensation methods hitherto used, and consisted of washing the gas with a petroleum distillate of about 34° Beaumé, and subsequent separation of the

gasolene by steam distillation, or, alternatively, with a naphtha of 55°. The distillate was simply a carrier between the absorbing vessel and the still, and could be used over and over again. The extraction of gasolene by compression already constituted a large and lucrative industry, and the production in the year 1914 was about 14 million gallons. Frequently the gasolene was mixed with naphtha, and the mixture could be used for motor fuel and other purposes for which the crude naphtha was quite unsuitable. About 17,000 million cubic feet of gas that formerly went to waste was treated by compression in 1914; and the average yield was 2·43 gallons per 1000 cubic feet. On account of a bad market, however, the production in that year was limited. In the following year, the production was over 75 million gallons, and in 1916 would be in excess of 100 million gallons. The compression only utilized the so-called "wet" gases, as it was considered not remunerative if the gas contained less than 0·75 gallon per 1000 cubic feet. Therefore, not only more than half the casing head gases had been exempted, but also all the "dry" gas, supplied to cities for general consumption, which amounted to 591,000 million cubic feet in 1914. Nearly the whole of this gas could be successfully treated by the absorption process.

While the predominant members of the paraffin series of hydrocarbons in natural gas were methane and ethane, the author found that, with few exceptions, propane, butane, pentane, and hexane were also present, and the last two constituted most of the gasolene obtained by absorption. The ethane gases probably included over 500,000 million cubic feet of the annual product. Some gases carried methane only, and therefore contained no gasolene. At 2 pints per 1000 cubic feet, the yield would amount to about 125 million gallons per annum—value, at 25 c. per gallon, $15,000,000—and some of the "dry" gases had yielded as much as 3 pints per 1000 cubic feet.

Condensation of gasolene in trunk lines was a source of much inconvenience, annoyance, and expense, because it softened and dissolved the rubber rings on the patent pipe couplings—now always used on all large pipe lines, in place of the socket and thread collar—and eventually caused blow-outs and serious loss of gas. In one instance, the supply had to be much reduced, and 26 men were occupied for 24 hours in locating and repairing the defect. Another company, controlling 35 miles of 18-inch pipe, that had carried 100,000 million cubic feet of gas for ten years, reported that the cost for rubber only had been $16,000. The removal of gasolene promised more security as to supply, and a saving on distribution expenses.

The boiling point of the absorbent should be so far removed from that of gasolene as to admit of complete separation by distillation. Each liquid had a saturation limit beyond which it would not take up more, and they had found that the limit for "mineral seal" oil was 28 per cent.—*i.e.*, the amount of gasolene absorbed would be 28 per cent. of the total bulk—but anything approaching this proportion was not feasible in practice. After 4 per cent., the extraction was not complete, and the proportion passing away with the gas increased until equilibrium was reached at 28 per cent. Two experimental plants were used—a small set that would take 100 to 200 cubic feet of gas at the rate of 100 to 300 cubic feet per hour, and a large set capable of continuous operation on 15,000 to 30,000 cubic feet per hour.

After trying several types of absorbing apparatus, a vertical tower scrubber, packed with stones the size of a fist, was found the most efficient. Two brands of oil were used as absorbents: (1) Mineral seal, flash point 275° Fahr., burning point 311°, first drop appeared at 405°, and 6·2 per cent. distilled over below 527°; (2) straw oil, flash point 361° Fahr., burning point 416°, first drop appeared at 482°, and distillation in quantity commenced at 527°. A gas having the composition of 76·3 per cent. of methane, 18·4 per cent. of ethane and higher paraffins, and 5·3 per cent. of nitrogen, specific gravity ·68, absorption in Russian white oil 17 per cent., gross calorific value at 32° Fahr. 1155 B.Th.U., after absorption by No. 1 oil, was found to consist of 79·7 per cent. of methane, 14·1 per cent. of ethane, &c., 6·2 per cent. of nitrogen, specific gravity ·65, oil absorption 16·7 per cent., gross calorific value 1111 B.Th.U. Another gas, consisting of methane 83·9 per cent., ethane, &c., 11·7 per cent., nitrogen 4·4 per cent., specific gravity ·63, oil absorption 15 per cent. gross calorific value 1111 B.Th.U., showed, after treatment, 88·3 per cent. of methane, 7·9 per cent. of ethane, 3·8 per cent. of nitrogen, specific gravity ·61, absorption 14 per cent., gross calorific value 1087 B.Th.U. The reduction in heating value was small, 3·8 and 2·2 per cent. respectively, and every gallon of gasolene abstracted represented a loss of 32 cubic feet in bulk; so that in most cases the loss was less than 1 per cent.

A circulation of from 7 to 8 gallons of oil per 1000 cubic feet was found to give the best results; but with the tower scrubber a reduction of nearly one-half would not prejudice the working. The gasolene obtained was fairly constant, specific gravity 80° Beaumé, distilling 10 per cent. at 80° to 110° Fahr., 20 per cent. at 110° to 124°, and 93 per cent. under 290°, with 7 per cent. loss. The evaporation loss by exposure to air was 10½ per cent. in 24 hours, 16 per cent. in 48 hours, and 20 per cent. in 72 hours; whereas refinery gasolene, during the same period, lost steadily at the rate of about 2·4 per cent. in 24 hours. The vapour tension at 100° Fahr. was 2·5 lbs. per square inch—well below the requirements of transportation companies for loading in tank-waggons. There was a considerable escape of uncondensed vapours during the steam distillation of the used oil, and the increase in the volume of oil did not correspond to the yield of gasolene, showing that a considerable quantity of lighter hydrocarbons were also absorbed. The vapour was further condensed by passing through a tube, 1 inch in diameter and 8 feet long, cooled down to 0° Fahr. In one instance the yield was 0·94 pint, 80° Beaumé, and an additional 0·2 pint was obtained from the refrigerator—making 1·14 pints in all. An increase of temperature from 75° to 85°, reduced the yield to the extent of 0·3 pint, and a yield of 0·71 pint at level gauge was doubled by increasing the pressure to 20 lbs. per square inch; but the rate of increase diminished with further additions to the pressure.

Tests with naphtha as an absorbent showed a yield of three to five times as much gasolene, compared with the distillates. In a series of three vessels, naphtha of 55° Beaumé was used in the first two, and mineral seal in the third; the object being to retain the whole of the extract in the first two. The yield ranged from 2·7 to 4·86 pints, and the best result showed an increase of specific gravity to 62°, and 16·6 per cent. in volume; and rather more than half these figures in the second. The vapour tension of the liquid was 5 lbs. per square inch, and the weathering loss 5 per cent. in 24 hours. The temperature of the naphtha had a great effect, and the maximum yield was obtained on a cold winter day when the temperature was 19°; but at 60°, a yield of 3 pints could be obtained. While naphtha increased the yield, it did not offer the advantage of repeated use as rendered possible by distillation; but it could be sold as prepared. Some six or seven times the bulk of the gasolene obtained would therefore have to be handled, as, if the absorption was carried further, the vapour tension exceeded the transportation limit. Naphtha could only be used in the vicinity of a refinery, on account of the difficulty and trouble concerned in the transportation of large quantities.

The authors had not investigated the applicability of absorption to wet casing head gases, which might contain 2 gallons or more of gasolene per 1000 cubic feet, and, on the above basis, would require a circulation of 64 gallons or more of oil; but there was much casing head gas, at present going to waste, considered too lean for the compression process. The absorption process was similar to that adapted for the extraction of light oils from coke-oven gas, but differed in that the natural gas must be treated at pressures of 200 to 300 lbs. per square inch. [The experiments quoted in the paper were evidently conducted under ordinary pressures, and no reference was made to arrangements for controlling high pressures.] Gases could be tested for yield by refrigeration, or by the use of a small absorbing apparatus.

In the course of discussion following the reading of the paper, several speakers verified the figures quoted. Reference was made to a simple process that had been adopted on a commercial scale for the removal of sulphur from natural gas. It was passed through a solution of ammonia, when ammonia sulphide was formed, which deposited free sulphur on heating.

Mr. Biddison said that the non-condensible vapours consisted chiefly of butane, which would not act on the rubber joints; so they might safely be returned to the gas. The liquid deposited in the mains and taken out of the drips was wasted because it usually contained so much non-condensible matter that distillation was not practicable; but liquids from outlets of compressors might possibly be used. Absorption was slightly cheaper than compression, and a combination of the two made an economical installation in some circumstances. The weathering loss of gasolene obtained by absorption was half of that shown by the compression extract.

The Dividend of the Gas Light and Coke Company.

The Secretary (Mr. Henry Rayner) intimates that the accounts of the Company for the past half year show that, subject to audit, the balance to the credit of the net revenue account will enable the Directors to recommend the payment of a dividend at the rate of £4 4s. per cent. per annum, carrying forward to the next account the sum of £480,512 6s. 4d.

The Corbet Woodall Scholarship.

A meeting of the Corbet Woodall Scholarship Committee was held at the Leeds University on Monday of last week, to consider applications from candidates for this scholarship, which, it will be remembered, was endowed by the late Sir Corbet Woodall, D.Sc., to commemorate the jubilee of the Institution of Gas Engineers. It was resolved to recommend to the Senate of the University that the scholarship be awarded to Leslie P. Ingram, of Truro.

Depreciation Rates Allowed on Gas-Works.

The following are given in the "Bulletin of Abstracts" in the July issue of the American "Gas Institute News" as the percentage rates of depreciation allowed by the Manitoba Public Utilities Commission in respect of coal-gas undertakings: On retort-houses and floors, 3½; other buildings, 2; benches, 4; boilers—water tube, 5; boilers—fire tube, 10; scrubber and condensers, 3; hydraulic main, 1; tar-extractor, 2; washers, 2½; exhausters, 3½; purifiers, 1½; station-meters, 3; ammonia concentrators, 5; ammonia storage tank—wrought iron or steel, 5; tar and ammonia wells, 1; water-gas machines, 3; centrifugal blowers, 6; holders, 2; governors, 1½; cast-iron mains, 2; wrought-iron mains, 3½; services, 5; consumers' meters and governors, 4.

A HOME-MADE TAR DEHYDRATING PLANT.

By W. Wyver, of Whitstable.

The following details of a small but efficient tar dehydrating plant may be of interest and use to others who may be in charge of gas-works whose size renders it necessary that strict economy in expenditure must always be studied, and where it is out of the question to order plants which cost some hundreds of pounds.

The writer has recently constructed in six weeks an efficient plant from stock and odd materials lying about the works, and an old boiler-shell procured locally for use as a still, and one special casting (the tapered still-head), also made locally. The boiler procured was the dome-end of a vertical Cochrane, which was full of tubes. These were cut out, and 3-inch angle iron was bent round the inside of the shell to form a flange, on which was bolted an end-plate. This took some time, as the works blacksmith had joined the Colours, and only a gas-fitter and mate were available to do the work.

The plant consists of an old boiler-shell, 7 ft. 6 in. long by 5 ft. diameter, which forms the still, set in brickwork with return flues on the same principle as a direct-fired retort-setting, with a brick shaft fitted with a damper for use when shutting-down the plant at night. The still-head is 12 inches diameter, reduced to 2 inches, and connects with a 2-inch coil-condenser in three tiers placed in a tank 6 ft. by 5 ft. by 2 ft. deep. This in practice was found unnecessarily powerful, and only the two lower coils of pipe are covered with water. But the degree of condensation required will depend upon the character and quality of the tar treated, and can only be determined on trial. A tar of high water-content will need more condensing power than a water-free tar; and in most cases a 3-inch coil would be desirable.

The still is fitted with a very simple safety-valve, made from a 4-inch by 2-inch reducing socket, with bridge across the wide end bored with a hole to carry a spindle fitted to a 6-lb. deadweight. A pressure-gauge is fitted to the still-head, and consists of an 8-feet U-tube, filled with green oil, and ending in a dial, as will be seen in the photographs. A dial thermometer is placed in the dome-end of the still, 18 inches from the bottom.

The distillates coming over from the condenser drain into an automatic separating tank, which, when once adjusted, allows the light oils to run direct into drums, and the ammoniacal liquor (water) to the storage well. This separator tank consists of a cylinder, 4 feet deep by 15 inches diameter (covered), and is so arranged that the end of the condensing worm delivers the condensate 6 inches below the overflow level, thus forming a seal. A 2-inch pipe connected with the worm-end thus sealed conveys the condensed foul gas to the small brick grid and oxide purifier.

The liquor overflow-pipe is taken from 6 inches off the bottom of the separator, and brought out through the side at the top. To ensure no oil passing away with the liquor to the storage tank, the overflow from the oils is through the side about half-an-inch above the liquor overflow level. It consists of an adjustable elbow set at an angle by means of a backnut. This is so adjusted that the film of oil floating on the water escapes thereby. When once adjusted, the separator needs no further attention.

The tar has been distilled at a temperature of 200° to 218° C. (392° to 424° Fahr.) during the five weeks the plant has been working; and the daily yield is 14 barrels of good working dehydrated tar, at a cost of 2½ cwt. of coke and 5s. for labour. The plant has worked smoothly and without a hitch. The setting of the still, chimney, purifier, and tank supports took 6000 stock and fire bricks, owing to the still being placed 5 feet above the ground-level, to admit of filling the tar-barrels direct, and also to ensure gravitation to the liquor storage tank 150 feet away.

The inclusive cost of the plant as installed works out at £100; and an iron roof which it is desired to fit will cost another £20.

[The accompanying photographs show the entire plant from two positions, with practically every detail; and the author will be pleased to give further information or to show the plant to any brother manager who may be interested.]

THE TAR-DEHYDRATION PLANT AT THE WHITSTABLE GAS-WORKS.

VALUATION AND EFFICIENCY OF GAS OILS.

A lengthy paper, dealing with the qualities and valuation for gas making purposes of American gas oils, was submitted at a recent meeting of the Illinois Gas Association by Mr. R. C. Downing, who remarked that, on account of the uncertain composition of the various brands of gas oils for some years past, the Peoples Gas Company of Chicago had established the rule of submitting samples of all oils purchased to practical tests in the laboratory.

Depreciation in Quality.

The author felt that future progress in the manufacture of carburetted water gas must be attended with the gradual accumulation of complete knowledge in respect to all details concerned. Gas engineers generally understood that the term "gas oil" represented one of the products resulting from the straight fractional distillation of crude petroleum, taken off between the burning oils and the lubricating oils, having a boiling point of about 650° Fahr., and free from gasoline and light oils, on the one hand, and from heavy oils and pitch on the other. This definition, however, no longer applied, because the refiner did not now limit his operations to fractional distillation, which produced a maximum yield of heavy oils, but also included in his treatment of the oil, destructive distillation, "cracking" by contact of the vapours with hot surfaces, acid and alkali rectification, filtration, chilling re-distillation, &c., with the result that the gas oil was no longer a straight product from one point of the distillation, but a mixture of several residues that could not be easily converted into more valuable products.

By the Burton process, nearly the whole of the crude material could be converted into benzol and toluol. This explained the higher prices and the tendency towards lower grades in quality; and their only remedy was the application of a greater degree of care and skill in connection with manufacturing operations. A study of gas-making values, extending over the last ten years, has shown a steady decrease—in some instances as much as 25 per cent.—together with an equally steady rise in prices. Candle power, however, may not always be the object in view. They all looked forward to the adoption of the more reasonable basis of B.Th.U. for the valuation of town gas; and it was possible that oils now valueless as enrichers may be found to be good heat producers. Attention might also be directed towards the use of other kinds of fuel oil; and our knowledge in this respect was scanty. The author had sought to arrive at a definite plan, applicable to the valuation of any suitable oil, that at the same time would throw some light on the working conditions, tending to secure the highest possible results.

Composition of Gas Oils.

The composition of a gas oil was very complex, as, while it consisted largely of paraffins, no less than thirteen other kinds of

hydrocarbons were found, besides small quantities of nitrogen, oxygen, and sulphur compounds. American crude petroleums included paraffin base light oils found in Pennsylvania and West Virginia; asphalt base black oils from Texas, Mexico, and California; and mixed base oils raised in various parts, from Ohio to Oklahoma. A good sample should not contain more than about 0·3 per cent. of sulphur; but this substance was often found to exceed 1 per cent. in the black oils. Gravity tests, fractional distillation, and chemical analysis were all of some use, but did not reveal the yield and quality of gas obtained under the most suitable working conditions. To arrive at such results, he had submitted the samples to destructive distillation in silica tubes, heated to a degree that could both be controlled and measured. The tubes were inclined towards the inlet, and the oil was admitted at a measured rate from a burette at the upper end. The gas was passed through a condenser, scrubber, and meter into a small holder, from which samples could be taken to the photometer, or for analysis.

Laboratory Tests of Practical Values.

Total yields of gas and of illuminants were calculated in terms of per gallon of oil; and the results of tests at several temperatures were plotted on diagrams, with the temperatures as ordinates and yields as abscissæ. A large number of these diagrams were exhibited. They showed that the yield increased with the temperature up to a limit of 1300° to 1400° Fahr., above which they steadily decreased. The curves served to detect inferior oils, and also to indicate the best operating temperatures. If thought desirable, the sample could be submitted to fractional distillation, and all or any of the fractions examined. The tubes the author used ranged from 1 inch to 2 inches in diameter, and from 30 to 48 inches in length; the flow of oil being adjusted to reproduce as nearly as possible the conditions of time-contact, area of heated surface, &c., that obtained in practice. The oil could be tested by itself or in the presence of such quantity and quality of blue gas as would serve to reproduce working conditions. A blue gas for this purpose was manufactured in a similar tube packed with small coke, and was stored in an 80-feet holder for use as required. It could be admitted in measured quantity with the oil, at the upper end of the tube. The oil or mixed gas was tested for permanency by passing it slowly through a 40-feet coil of ¾-inch copper tube, immersed in water maintained at 40° Fahr., after which it was again tested for calorific and photometric value. Loose cotton was found to be an efficient material for packing the tar-scrubber.

The bromine absorption—*i.e.*, the number of grammes of bromine absorbed by 100 grammes of the sample—was a useful test. Bromine combined with paraffins and naphthenes in sunlight, but not in the dark. Unsaturated hydrocarbons were, however, absorbed under all conditions. A gas oil containing products from the "cracking" of crude petroleum had a high bromine absorption. The acid treatment was another useful test. Paraffins and naphthenes were not readily attacked by fuming sulphuric acid; but it would dissolve the aromatic hydrocarbons. These were not affected by the ordinary concentrated acid, which acted on the lower members of the olefines. He had found that, by the rectification of a sample with acid, he obtained a higher grade oil, which proved that for gas making the paraffins and naphthenes were the more valuable constituents.

A gas oil under the influence of heat was first vaporized, and then decomposed. Given sufficient time and temperature, the ultimate products would be hydrogen and carbon. The researches of Tocher* showed that octane and decane could be decomposed by heat, with the formation of lower paraffins, olefines, and hydrogen. At 930° Fahr., olefines, methane, and hydrogen were among the products; but those obtained at 1630° consisted of ethylene, methane, and hydrogen only. Octane at 1000° broke up into ethylene, propylene, and butylene, and at 1400° yielded ethylene, carbon, and hydrogen. Extended time contact resulted in similar formations at lower temperatures. The working pressure had an important effect. At diminished pressures, the yield of gas was increased, and the formation of carbon prevented; less free hydrogen being produced. The effect of dilution was also important. Decomposition in a current of hydrogen limited the splitting-up, and tended to increase the volume of hydrocarbon gases at the expense of the tar and free carbon. A decrease in time-contact was found to have a similar effect to reduction of temperature.

The primary factors to be considered were the temperature, the time and intimacy of contact with the heated surface, the pressure, and the presence of foreign gases. In the generator, the make of blue gas would be influenced by the composition, temperature, and extent of surface presented by the hot fuel, rate and period of blasting and of steam introduction as determining contact time with the fuel, and by the extent of free space for steam or air. The yield and composition of the mixed gas turned upon the proportion and composition of the blue gas and oil gas, rate of oil introduction, temperature, extent, time, and intimacy of contact with the hot brick surface, the free space, and the pressure. With so many variables, the only way of getting at the facts was to control the whole as much as possible, and then to observe the effect of one fundamental fact separately. This was the line on which the author had been working.

Results.

After some account of the defects in the first models, which had gradually been eliminated in the course of experience, and full details as to methods of procedure, the author discussed the results arrived at, with the aid of a specimen report sheet, showing the figures obtained by the examination of a mid-continent oil. Specific gravity, ·8614; flash point, 206° Fahr.; B.Th.U. per lb., 18,680; initial distilling point, 206°; final ditto, 700°, with a residue of 5·4 per cent. Ultimate analysis, 87·24 per cent. of carbon, 12·35 per cent. of hydrogen, 0·26 per cent. of sulphur; bromine absorption, 16·6 per cent.; average temperature of decomposition, 1307°; ratio of heating surface to free space, 24 square feet to 1 cubic foot; rate of oil feed, 2·2 cc. per minute; rate of blue gas feed, 1 cubic foot per minute; gas obtained (corrected) 1·492 cubic feet oil, 3·898 cubic feet blue—total, 5·39 cubic feet. Tar made, 30 grammes, specific gravity 1·054; carbon content, 83·8 per cent. In terms of make per gallon of oil, 53·8 cubic feet of oil and 194·3 cubic feet of total gas; candle power, 24; consumption of oil per 1000 cubic feet of gas made, 5·15 gallons. Of the oil, 65·7 per cent. was recovered as gas, and 29 per cent. as tar; leaving a loss of 5·4 per cent. of carbon, &c. The specific gravity of the mixed gas was ·679; the calorific value, at 40° Fahr., 696 gross, 644 net, B.Th.U. per cubic foot. Analysis of the gas showed 14 per cent. of illuminants, 21·2 per cent. of methane, 28·4 per cent. of hydrogen, 29·1 per cent. of carbon monoxide, 2·8 per cent. of carbon dioxide, oxygen, and nitrogen 4·5 per cent., and sulphuretted hydrogen 100 grains per 100 cubic feet. The blue gas consisted of 50·6 per cent. of hydrogen, 40·6 per cent. of carbon monoxide, 3·4 per cent. of carbon dioxide, 0·8 per cent. of methane, 4·8 per cent. of oxygen and nitrogen, with 75 grains of sulphuretted hydrogen per 100 cubic feet.

There had been made 150 tests of various oils under different conditions, and the real effect of the factors above instanced, as shown by the diagram curves, always exhibited the same general tendencies. The maximum candle power was produced at 1250° to 1300°, and the greatest calorific value at about 100° higher. Between 1250° and 1420°, the photometric efficiency varied 10 per cent.; but between 1350° and 1520° the calorific value only varied 2 per cent. This showed that it was easier to maintain even heating than lighting value. The stability was greater with gas produced at high temperatures; but in such circumstances naphthalene made its appearance, both in the gas and in the tar. At 1300°, the author would expect the oil to be resolved into 60 per cent. of gas, 30 per cent. of tar, and 10 per cent. of carbon and waste. Outside the temperature ranges above named, poorer results were usually obtained. A peculiar feature was that at low temperatures hydrogen was absorbed, and the proportion in the mixed gas was less than in the blue, to the extent of 4 or 5 per cent. Methane increased steadily with the temperature, and ethane appeared at 1200°, and reached 3 or 4 per cent. as a maximum at 1400°. Of the usual 100 grains of sulphuretted hydrogen, about 70 grains were due to the coke in the generator and 30 grains to the oil; and the lower the temperature, the greater the proportion retained by the gas.

Time contact depended to a great extent on the temperature of the generator fuel, which was known to drop at the rate of 40° per minute during the run in an ordinary generator. According to data published by the United States School of Mines, during a run of six minutes the temperature fell steadily from 2240° to 2020°, and the make of gas from 2800 to 1300 cubic feet per minute. As the steam admission rate was constant, the excess steam towards the close would probably compensate for half this diminution. The effect of a variable rate was that the contact time would vary in inverse proportion. There was a marked advantage in shorter contact time; and he had found that 5 seconds gave 9 per cent. greater oil efficiency than 10 seconds, and that a range from 1¼ to 10 seconds showed a possible variation of 19 per cent. in the candle power, but only 3 per cent. in the heating value. The short-period gas was nearly as stable as the other, which showed that long contacts carried the cracking too far, and decomposed the desirable illuminants; but a short contact time meant a hot fire in the generator. The spacing of the chequer work in the carburettor and superheater affected the contact time. The tubes he had used corresponded to four different spacings; but he had not yet arrived at definite conclusions on this point. The rate of oil input, as influencing the proportion between oil and blue gas at any one moment, also had a marked effect. The illuminating efficiency per gallon of oil increased with the input up to about 5 gallons per 1000 cubic feet, but it was less beyond this limit; and the British thermal units per gallon decreased with increased input. The presence of carbonic acid or other incombustible in the blue gas influenced the results in other ways than as a diluent, and a poor blue gas meant less gas and more tar in the mixed product.

* "Journal of the Society of Chemical Industry," 1894, p. 231.

The Training of Industrial Chemists.

It was announced at a meeting of the Huddersfield Town Council last week that the Directors of British Dyes Limited have decided to make a contribution of £5000 towards the cost of providing a new department at the Technical College for the training of industrial chemists. This step has given much satisfaction to the Council and the general public. The new department will be controlled by Dr. A. E. Everest, who has had Continental experience, and has for some time been carrying out investigations upon colours and paint pigments.

SOCIETY OF CHEMICAL INDUSTRY.

Annual Meeting in Edinburgh.

THE Annual General Meeting of the Society of Chemical Industry was held in the Hall of the Edinburgh University Union, Teviot Place, Edinburgh, on Wednesday, Thursday, and Friday of last week. The meeting took the form of a congress on the progress of chemical industry in Great Britain since the outbreak of the war; and in connection with the meeting there was held in an adjoining room an exhibition of coal-tar dyes, glass, porcelain, &c., and of products of certain local industries. About 160 delegates attended. Lord Provost Sir ROBERT KIRK INCHES, of Edinburgh, presided at the outset on the opening day; and thereafter Mr. CHARLES CARPENTER, D.Sc., the President of the Society, occupied the chair.

WELCOME TO THE DELEGATES.

Lord Provost INCHES, in extending a welcome to the delegates, recalled the fact that the Society visited Edinburgh in July, 1894. Though Edinburgh was not actually an industrial centre, there were a number of important chemical industries carried on in the district; and specimens of the products of these local industries were to be on exhibition. They would thus be able to see what was actually being turned out.

The presentation of the Council's report and the statement of accounts was followed by the

PRESIDENT'S ADDRESS.

Mr. CARPENTER, after a few prefatory remarks, proceeded:

Foremost among our thoughts here must be consideration of the relationship between the educational and the industrial problems. Three aspects of this seriously concern us. First, I would place the need of recognition by professors of learning of the necessity to the country of a cultured industrialism; second, the acceptance by industry of the faith that only through science can it develop and prosper; lastly, but not least important, the understanding by statesmen that neglect of these principles will be as deadly to the nation as disregard of its health or morals. When the effect of bounty-made sugar in damaging what was once a flourishing British industry was pointed out to Gladstone, he retorted "make jam." He would not have uttered this remark had his knowledge of industry been comparable with his mastery of Greek.

This takes us straightway to the root of our difficulties, "Does the education of our statesmen properly fit them for the posts they are destined to occupy in the management of this great Empire?" How many of them would not have given Gladstone's answer to a similar question put to them two years ago? It came as a rude shock when, but a few weeks after war was declared, they woke up to the fact that, whatever our jam resources may have been, we were lamentably deficient in powder. Fate had unhappily made it impossible for us to rely on the same source of supply as we fell back upon in our last great struggle. Of what help to our statesman was familiarity with the Trojan war, the Punic wars, or any of the great conflicts of ancient times, in the mortal combat in which we have been engaged for the past two years? The industrial sciences are now the dominating factors, not cleverness in classics; and slowly the nation is becoming alive to it. Is it not time, then, that our educational houses were set in order, and that the atmosphere with which they are permeated, and by which the best of the nation's youth is so largely imbued, was charged with other ideals? Is there not in our mother tongue an adequacy of classic thought and expression sufficient to provide exercise and food for the developing mind?

Now this is where it seems to me, the Edinburgh Section of the Society can play an important part. The University is celebrated throughout, and attracts students from all parts. It possesses a great advantage in that the city has a substantial voice in its counsels. What a step forward would be gained if it could be inspired to take upon itself the responsibility of placing science in the forefront of its teaching; if among all the older institutions it set the example in a change which sooner or later is bound to come over the spirit of teaching if we are to hold and maintain our place among the nations! Surely physical science deserves—nay, demands—to-day a place in the scheme of education along with that of morals, and coupled with such languages that may be read first-hand in its story-books, and inspiration found in the records of its far-reaching discoveries and the paths followed by explorers in their seeking. Its meditations, too, are always healthy ones, whether pursued in the laboratory or the study.

The suggestion has, however, been put forward that the mental characteristics of our race do not fit it to become expert in the science of organic chemistry. In my humble, but considered, opinion, this is a fallacy. I believe there is no reason why we should not as a nation attain eminence therein, as we have in seamanship or shipbuilding. Our youth, however, needs an apprenticeship on land as earnest-compelling as that afloat, where carelessness brings speedy retribution. There are, no doubt, many scores of students who have a natural capacity for organic chemistry had fate but willed its exercise, or had there been its atmosphere in our educational centres as of salt-spray at our ports. But, it will be asked, will our manufacturers avail themselves to the full of the services of skilled chemists; are they not already too often disappointed by results? Certainly they will be again and again, if they only call them in when in trouble and expect them to successfully wave a magician's wand over their recalcitrant processes. There are two main difficulties to be encountered in transferring laboratory work to the large scale. One is its economics; the other its practicability. Most people are aware that to extract gold from sea water is a proposition financially faulty. Chemists need too often to be reminded that, though a process may be pretty, it does not attract a manufacturer unless it is sound.

As part of the training of chemists, careful attention should be given to the matter of costs, by setting problems for research in which definite prices are allowed for the raw materials to be used. In addition to this, values should be fixed for the various operations involved, such as distillation, ordinary or vacuum, filtration, crystallization (whether from water or other solvents), centrifuging, and so on. The chemist would thus be trained in the laboratory to the importance of price questions, which are certain to arise in the course of his work. He might also be counselled to listen patiently to the so-called practical man, whether leading hand or otherwise, who may be entrusted with the charge of carrying on the large-scale work. There is every probability that he may learn something from him just as there are circumstances at sea when we would feel safer in the hands of a local fisherman than the captain of a Cunarder.

The other important factor in setting up large scale and modern processes is the increasing need for the engineer to take an important share in their development. Not only must the process itself be theoretically, but also industrially, sound. Heat, power, and labour absorbed, together with the scale of adaptation and the nature of the plant employed, are matters upon which the trained engineer is peculiarly fitted to give valuable advice with a view to reduce output costs to their lowest level. The engineer may, indeed, be regarded as a no less needful adjunct to the chemist in such circumstances than is the surgeon to the physician in problems pertaining to health. How many chemical inventions have failed to mature because of engineering difficulties attending their development? The mutual obligation to each other of the chemical and engineering sciences is an increasing one, and of which a very good example is the synthetic production of nitrogen compounds.

There is yet a third factor to be considered in the pursuit of efficiency—namely, the workmen. For some twenty-seven years the undertaking with which I am chiefly associated has practised a system of co-partnership with its employees. The manufacturer who seeks the highest chemical yield and the highest mechanical yield stops short of his goal if he overlooks the part played by labour, and does not aim at its highest efficiency also. The chemical worker is as necessary to the well-being of the State as the sailor and the soldier. Yet how many go to their work with the same alacrity and cheerfulness as the latter to their death? The reason is not far to seek; they share the responsibilities and advantages of progression, and their duties and rights are recognized in the supreme counsels of the nation. In industry such ideals are, unfortunately, a long way from attainment. It would take many inventions and much wisdom in management to do for industry what its own labour could, were it but imbued with the idea of how much could each industrial unit turn out, instead of how little. The Company to which I have referred have gone a long way in the direction of realizing such hopes; and to-day, of its 6800 workpeople, over 6000 are shareholders. Anticipating the not unusual criticism, may I here add that while in France no similar undertaking is working under these conditions, they have been largely applied in many other industries. Two practical examples of utility happening within the past fortnight may be interesting. The one is of a leading hand who, expressing the hope that we had made a wise choice in the appointment of a new manager, remarked that all his life's savings were invested in the business. The other is of a corporal just returned from the front, where he had been since the outbreak of war, who brought in French notes all his savings of pay to be invested in the co-partnership.

I should like, before leaving the debatable ground of Capital and Labour, to refer to a practice which, I believe, would be found useful by all employers. It is that of holding inquiries into every industrial accident by juries of workmen (in fatal cases, after the coroner's verdict has been given). This has been found very helpful in reducing the number of cases as well as their seriousness. It must be remembered that efficiency is not only concerned with raw material, but per unit of human life employed. Necessarily, it is the former point of view rather than the latter which has largely dominated the work achieved by our Society in the third-of-a-century of its existence; and it is interesting to note how the history of chemical industry in this country has been recorded in the pages of the Society's "Journal." Its earlier

volumes describe the triumphs of those technologists whose names are familiar to us as household words—Weldon, Siemens, Mond, Beilby, Chance, Hürter, Gilchrist, and many others. In later years, the progress made by other countries grows more in evidence—outstanding examples being synthesis of indigo and of ammonia, though a notable exception is provided by the work of Messrs. Cross and Bevan, whose work on cellulose laid the foundation of a large industry.

That the Society has "done its bit," in the parlance of the hour, in the making of the history of applied chemistry, cannot be doubted. Might it have taken a larger share? It is not easy to answer such a question, despite the opportunities given by time for the acquisition of belated wisdom. Perhaps its greatest opportunity for what I will call original work might be regarded as not only the bringing together of the expounders of theoretical and the practitioners of technical chemistry, but to have made them such friends that each gathered understanding from the other. Now, surely, there never existed so suitable a problem for a round-table conference as that of the utilization of the fuel supplies of the kingdom. No one could possibly quarrel with the description of our coal resources as being the most important of our capital assets. Yet the bulk of the country is busily engaged either in squandering that capital or in bartering it away and living on the proceeds. If water power be looked upon as a national heritage —and such a view is finding increasing adherents throughout the world—the arguments in favour apply with greater force to the deposits of coal; for these are limited, despite their greatness, while the falls are inexhaustible.

Parliament has already placed under authority our tidal rivers, the use of which is regulated for the common good. Should the development and utilization of our coal resources be left unrestrictedly to the individual or the group of individuals acquiring mining rights, generating energy, or warming their dwellings, or should such matters be subject to State supervision and control? Should the payment of two or three pence per ton be the solitary factor deciding whether or not the nation's coal leaves its shores to be worked up into bye-products by the nation's competitors in industry? Could the large demand for fuel required for metallurgical purposes abroad be met by the export of coke, instead of coal—leaving the bye-products to be utilized and handled here? Has the time come when the raw coal exported should pay substantial duties to the State, and every user at home be required to satisfy the authorities before obtaining quantitative licences for its consumption? Will a democratic Parliament ever follow the example of an autocratic government and prohibit the combustion of raw coal in our cities and towns?

Now that we are at last receiving encouragement in thinking Imperially, problems which seemed stupendous show themselves easy of solution, and, what is more, they will compel attention and decision. Certainly that of coal utilization may well commend itself to our Society. It may be asked, "Is not this the case with all matters pertaining to the welfare of chemical industry?" I do not so regard them. Take, for example, free trade or scientific tariffs, or the attitude of the State in labour matters or in special legislation, or in collaboration in the large-scale manufacture of chemical products. While such subjects may be proper ones for discussions by a Society such as ours, it clearly is not in a position to speak on them with a united, or even an authoritative, voice. It is mainly for this reason that there has recently come into being a new organization in the shape of a British Association of Chemical Manufacturers. Owing its being to the Chemical Society, and its development to our own, we may describe it as by pure out of applied science; and I believe it will prove worthy of its parentage. Its proposed constitution will provide the fullest powers to work with kindred Associations, on the one hand, towards industrial efficiency, and, on the other, by the encouragement of training and research. Its formation will certainly relieve the Imperial Parliament from such time-wasting occupation as discussing what restrictions should be placed upon the producers of coal tar who propose utilizing its distillates for the preparation of other substances.

In concluding his address, Mr. Carpenter said, may it not be hoped that those who live by, or through, the chemical industry of Great Britain will not lightly put aside consideration of the possibilities that such a proposal holds out? We want physical science—of which chemistry is after all but a part—recognized as entitled to a place in the teaching of the schools throughout the kingdom. We want provision made for its deeper study by technical and secondary institutions wherever industry is established. We want chairs of chemistry, organic as well as inorganic, at all our Universities, new and old; and the need of these things we must press unceasingly upon those who are entrusted with the duties of government. But we must build our own temple to the science among whose votaries we claim to number ourselves, and chemistry is no less worthy of such honouring than her other sisters in the arts and sciences whose Cinderella she has been so long.

A Vote of Thanks.

Professor Armstrong, in proposing a vote of thanks to the President for his address, said they wanted a more thorough study of science. What was the use of being taught science, if they were not going to use it? As to the reference to the need of connecting chemistry with engineering, the President had set an example in associating himself with the chemist, and developing his beautiful process of sulphur purification. With regard to the attitude of the workmen towards industry, was it not time that they realized how the industry of the country depended on the workmen? There was the question of fuel economy. They could never get the Government to take these matters in hand from the point of view of knowledge. They wanted to bring in the help of the trade unions; and if they did not, they would not be able to effect the change desired.

The President, in acknowledgment, suggested that the followers of industrial science deserved the same recognition of the important part they played in the civilization of the world as did the sculptor who was celebrated for his statue, or the painter for his picture.

Other Business.

It was agreed that the place of next year's meeting should be Birmingham.

The result of the ballot for the appointment of members of Council was: Messrs. E. V. Evans, E. Grant Hooper, R. D. Pullar, and A. Ree.

Thereafter the company were entertained at luncheon by the Edinburgh and East of Scotland Section of the Society.

When the proceedings were resumed in the afternoon, the reading of papers began. Abstracts of those of more particular interest to readers of the "Journal" follow, with points from the discussions.

WASTE IN COAL PRODUCTION.

By Professor Henry Louis.

Pointing out the fact that the coal output for 1913 is given by the Home Office as nearly 287½ million tons, Professor Henry Louis, in a paper dealing with waste in coal production, said it is important to note, in the first instance, how much of this total output is actually available for use by the nation at large, and, in the second place, how much other coal has been sacrificed in order to obtain this output.

From the total output of coal, there is, first of all, to be deducted the coal used in what is generally spoken of under the heading of colliery consumption. Definite information as to the quantity of coal burnt for colliery consumption is not obtainable, and a very rough guess is all that is possible at present. From his own observations, the Professor is inclined to think that the colliery consumption of the country is somewhat of the order of 7 per cent. of the total output or (say) about 20 million tons. It is evident that if groups of collieries would combine to erect central gas-producer plants, using low-grade coals, from which power could be distributed to the various pits within a reasonable radius, the saving that could be effected by the utilization of the bye-products, and by the substitution of inferior for better-class coal, would amount to a very large annual sum.

In many districts vast quantities of fine coal dust accumulate in the screening plants and lie there until periodically (when the nuisance becomes too great) they are cleaned out and the dust thrown away. Such coal dust is in many cases quite fine enough to be used direct for firing boilers or furnaces, and is well adapted for this purpose. Here, again, is a source of economy which in some parts of the country would be decidedly important.

With regard to underground operations, the waste in undercutting is being gradually decreased by the use of coal-cutting machines instead of undercutting by hand. Much more might no doubt be done in the substitution of machines for hand labour. But the subject is a difficult and complex one; and it was not the intention of the author to suggest that the indiscriminate use of coal-cutting machines is in all cases to be recommended. Nevertheless, it ought not to be forgotten that our coal reserves are a national asset, and that the interests of the nation at large should receive some consideration as well as the immediate profit that the colliery owners draw from their operations.

The author holds the view that, although coal in this country belongs rightfully to individuals, it constitutes as a whole a national asset, and the nation is entitled to protect itself against undue waste. As to the proportion of coal that is left in the ground, here, again, nothing more than a very rough guess is possible. He estimated the proportion as something of the order of 5 per cent. of the coal existing in the seams, so that the total quantity is formidable enough. It may be as well to point out that the coal thus left in the ground cannot be, as has sometimes been asserted, looked upon as a reserve that future generations may be glad to utilize. On the contrary, coal so left behind cannot be won afterwards, and must be looked upon as irretrievably lost.

It is practically impossible to present any figures showing the amount of coal lost to the nation as the result of deliberate waste, but it certainly amounts to enormous quantities in the aggregate. It is not easy to suggest any remedy for this loss. Some authorities favour legislation; and the imposition of heavy taxes upon coal left behind has been suggested. This can hardly be looked upon as a scientific solution of the problem, and undoubtedly a better remedy would be the invention or the elaboration of methods of utilizing inferior coals, which would give them a value sufficient to make it worth the while of colliery proprietors to work the whole of their coal.

Professor Louis's object in submitting his paper was to bring before the Society some information as to the nature and magnitude of the losses involved in the getting of coal as an integral portion of the investigation of the problem of fuel economy, and incidentally to point out that, though these are essentially problems

for the mining engineer, yet it is highly probable that the assistance of the chemist will have to be invoked before their complete solution is arrived at.

Discussion.

The PRESIDENT said the importance of the matter discussed by Professor Louis was extremely great. When one realized, taking the Professor's figures, that the amount of coal being used in getting coal was about the same as was employed by the whole of the railways in the United Kingdom, one obtained an idea of the magnitude of the loss that was going on in one direction only. More attention ought to be given to it, because fuel was the most important factor of all industries in the United Kingdom. He read a letter from Mr. Wallace Thorneycroft, of Stirling, agreeing with the author's opinions, and referring to the need, in the national interests, of encouraging the tendency to amalgamate in all branches of industry.

Professor LOUIS, in reply, referred at some length to the question of pit-traps, which had been raised by several speakers. Proceeding, he said that from his experience of other countries, he was utterly opposed to the nationalization of mines as a means of saving. It had been tried to a considerable extent in Germany, and had proved a failure from the economic standpoint.

FUEL ECONOMY.

By Professor HENRY E. ARMSTRONG.

The present position of the question of fuel economy was briefly summed up, in the form of a few propositions, by Professor Armstrong. He urged that the time for discussion is past. What is now needed is constructive action. Will the Society, he asked, take its share—a preponderant share—in dealing decisively with all issues in which chemical industry may fairly be considered to be concerned? The situation is daily becoming more and more serious; and the organization of power schemes in important industrial areas is probably one of the first subjects to consider. At the moment, not only is coal dear beyond all expectation, and procurable with difficulty, but we are in face of an absolute shortage of liquid fuel for internal combustion engines, and of a shortage of the dyestuffs that are made from various products of the destructive distillation of coal—partly because of a lack of raw material.

The utilization of coal therefore has to be considered not only from the point of view of securing a maximum output of heat energy, but from the far more comprehensive aspect that coal is to be regarded, not merely as a source of energy, but as the raw material from which both liquid fuel and the primary materials required by the dyestuff industry and other branches of organic chemical industry are derived—not forgetting the high explosives—and also as the potential source of vast quantities of ammonia. We have little moral right to use coal simply and directly as fuel. From this point of view, should we not memorialize the Government at once to foreshadow legislation at no distant date prohibiting the use of raw coal as fuel?

Only enthusiasts will think of electricity and gaseous fuel as sole sources of heat energy. The sane will continue to regard solid fuel as requisite for domestic and manufacturing purposes—in the latter case, at least as a material to be gasified locally. From this point of view, soft coke is necessarily to be regarded as the solid fuel of the future. Yet, if this be the conclusion, a situation will soon be created that must not be overlooked. Obviously, if gas and soft coke be the fuels of the future, the town-gas industry, as at present conducted, will need some complete reconstruction. The gas-works will be called upon to produce both gas and soft coke and to serve as the primary source of fuel supply in the district. Moreover, the works will necessarily be run in conjunction with the supply of electricity. Already the Brighton Corporation have made arrangements for the installation of a coking plant alongside their electric works; the gas to be used in firing the boilers of the latter. It will be but a small departure to obtain an Act forbidding the use of raw coal in the district, which will make the soft coke produced of special value to the town.

In his recent Newcastle paper, the author referred to the production of soft coke as still problematic. He was not then aware what had been done by way of improving Mr. Parker's process, which gave a coke of unexceptionable quality, though on far too small a scale to be practicable. In the interval, a gas-fired fire-clay oven has been devised in which coking can be effected on a satisfactory scale. Similar plant will soon be in operation in this country near Barnsley, in the centre of the South Yorkshire coal field. This will be run in conjunction with an electric works and a tar distillery.

There are many problems connected with the economical use of coal which must be fully inquired into. It is essential that both the funds and the machinery for such inquiry should be provided without delay. The appointment of a Central National Fuel Board to initiate and supervise all necessary inquiries, would seem to be the first step that is called for; and the author ventures to think that no better way of obtaining funds can be suggested than a small tax on all coal raised in the country.

Discussion.

The PRESIDENT said that Professor Armstrong had put his finger on the very weak point of one of the problems which was now engaging a certain amount of the scientific thought of the country. This was, How could the various processes for the synthetic production of nitrogen be applied in this war? It was extraordinary that, while this investigation was going on, there were millions of tons of coal being burnt in which the whole of the nitrogen was being absolutely wasted. Referring to the coalite experiments, he said it was gratifying to know that there was a prospect of a plant working in which difficulties had been eliminated.

Dr. E. F. ARMSTRONG thought there was still a great deal to be done by manufacturers in economizing coal. A firm he was engaged with employed a highly skilled chemist to do nothing but look after the fuel and water supply; and the policy had been fully justified by results. He thought it quite possible for half-a-dozen firms, working with one another, mutually to engage an expert to look after all their fuel problems.

The PRESIDENT pointed out that a difficulty with regard to the coalite process as originally worked was to find out what the products of distillation really were. It was extremely hard to get at the composition.

Professor ARMSTRONG, in reply, said that reference had been made to the desirability of educating public opinion and Members of Parliament. But it was they themselves who were the people to be educated. He wanted to make it clear to the Society that they had a mission to fulfil. They came, not to form opinions, but to formulate them.

BYE-PRODUCTS COKE-OVEN PRACTICE.

Some Recent Improvements.

By G. P. LISHMAN, D.Sc., F.I.C.

In a paper dealing with recent improvements in bye-product coke-oven practice, Dr. Lishman remarked that since the introduction of the direct processes, there has been no great change in coke-works practice in this country. The high wages paid in coke-works have led to numerous labour-saving devices; and it is largely with items of this kind that the paper was concerned. Most of these appliances have been in use in odd places for some years. What may be regarded as "recent," however, is the general adoption of a number of them in conjunction with each other on recent plants.

Reference was made first to the increasing size of ovens. In America, 16-ton ovens have been built for some time by the Solvay Company. The largest oven working in England to-day is the Collin, at Middlesbrough. Here the 72 ovens make 3000 tons of coke per week. The Solvay Company have also completed a battery of 12-ton ovens in England; and the Simon-Carvès Company have a battery of 11-ton ovens ready to start. The author is informed that in Germany an oven 3·5 metres in height is now working.

After some remarks upon charging apparatus, coke-handling, mechanical and split ascension-pipes, door-lifting winches, and high-speed turbo-exhausters, the author proceeded as follows:

SEMI-DIRECT PROCESSES.

With regard to bye-product plant, it cannot be said that there is any really important improvement to record for the last few years. The direct process has come to stay; and the different varieties are too well known to be described here. There are two similar semi-direct processes, however, which have just started working in England. These two processes are both working successfully making excellent salt; and an account must be given of them, not because they are better than others, but because they are newer. They are both modified Mont Cenis processes—one run by the Semet Solvay Company (Marr's patent), and the other by the Collin Company. The great point in connection with all direct and semi-direct processes is to avoid making too much mother liquor; and it is in the schemes to this end that the various designs differ.

THE SOLVAY SYSTEM.

In the Solvay process, benzol is extracted from the gas before the ammonia. In this way, the re-cooling of the gas after the saturator is avoided. Whatever the drawbacks of such a process may be—and none appear to have yet shown themselves—it is certainly a saving both in capital expenditure and in cooling water. After leaving the benzol scrubbers at 20° to 25° C., the gas is led to the saturator, receiving on its way ammonia-steam from the still which deals with the condensed liquor. The steam, as soon as it comes into contact with the gas, is suddenly cooled down to an equilibrium temperature of about 45° C.; and an amount of water-fog is formed which, if carried on to the saturator, would, by diluting the bath, tend to prevent the crystallization of salt, and produce too much mother liquor. This water-fog is therefore extracted from the gas by passing it through a special separator, which is understood to be of the nature of a Pelouze tar-extractor. This apparatus drains back into the still, and the gases saturated with water, but no longer supersaturated, pass forward to the acid bath. Owing to the heat liberated in the reaction, the gas temperature at the bath outlet is from 55° to 60° C. The gas is still saturated; and when it is considered that each cubic metre raised 10° C. will carry away 63 grammes of additional water, it is obvious that there is no fear of excess mother liquor. In practice, water is added to the bath all the time. The liquor feeding the still is preheated in a heat exchanger by waste liquor coming from the still.

The Collin Process.

In the Collin process, the benzol-scrubbers come after the saturators, which involves re-cooling of the gas. The method of drying the gases coming from the still is also different. The vapour from the still can join the gas by either of two pipes; and the amount passing each way can be regulated. One of the pipes leads straight to the gas-main, while on the other is a liquor heater which serves to dry the ammonia-steam. This is simply a tubular heater of different form altogether from the original Mont Cenis heater and dryer. In this way, the ammonia-steam is prevented from supersaturating the gas with water; and the water-fog which is extracted in Marr's process is in this case prevented from forming. The gas temperatures are practically identical in the two processes; and in each the rock-salt difficulty has been found and overcome. Hot water everywhere is the cure; and the process admits of considerable quantities being used. Also, it is well to have a lead steam-pipe in the saturator, and give it a boil-up once a week. In addition, the acid should be run-in up to 18 per cent., worked-down to 8 or 9 per cent., and then made-up again. Continuous working at one acid strength is apt to lead to rock-salt.

Removal of Naphthalene.

In connection with the direct process, one of the problems which presents itself where benzol is recovered is the removal of naphthalene during the cooling of the gas. After the saturator, direct-process gas, though perfectly free from tar, contains anything from 10 to 20 grammes of naphthalene per cubic metre. Its temperature is about 80° C. It can be cooled down to 55° C. in tubular coolers in the ordinary way; but coolers after that rapidly become blocked with naphthalene.

Three methods are used for overcoming this: (1) Duplicate plant up to the benzol-scrubbers; one part being steamed out while the other is in use. It is desirable to duplicate even the gas-main to the scrubbers, and to keep it as short as possible, and give it plenty of size, as it is always liable to block. (2) The Otto method of direct cooling in a tower by contact water-sprays. The quantity of water required is very considerable; but where this is available, the contact method is the simplest and best. The naphthalene is washed down in granular form, and may be skimmed off the water as it flows through troughs. (3) Messrs. Simon-Carvès, Limited, have patented a process which consists in spraying the gases with creosote oil, which dissolves the naphthalene; and the oil when saturated is pumped into crystallizing pans, from which the liquid oil is subsequently run off and used again. The circulating oil naturally mixes with the condensings from the gas; and the complete and continuous separation of the oil and water in special tanks is part of the process. In warm weather, the naphthalene does not separate very well; but the process is effective.

Ammonium Chloride.

Where the coal contains sodium chloride, a good deal of the ammonia can be recovered as ammonium chloride. Sometimes 30 per cent. of the salt made can be obtained as chloride. The direct process lends itself well to the recovery of ammonia in this form, as in the washing of the gases with hot liquor the chloride is extracted. A saturated solution is obtained, which is evaporated to obtain a crude salt. The salt (a fair colour at first) soon turns black. It has been found that, if the dark salt is heated for some time to a temperature just short of volatilization and redissolved in water, the carbonaceous matter is rendered insoluble. After settling and filtering a clear liquid is obtained, from which a permanently white salt is produced by evaporation. This method has also been patented by the Simon-Carvès Company; but I hear that there is now another process in which the same result is produced in one evaporation.

In his concluding paragraphs, Dr. Lishman pointed out the manner in which the number of bye-products manufactured at coke-works is being extended.

Discussion.

Mr. E. F. Hooper said that, in connection with the development of fuel economy, he thought they must look for a development of the coke-oven industry. They did not make anything like a proper use of coke-oven gas to-day. In Germany, there was a great deal of co-operation between the iron and steel industries and the colliery industry; and it was owing to this co-operation that they were able to work to such advantage.

TAR DISTILLATION INDUSTRY.

By W. H. Coleman.

In the course of his paper, Mr. W. H. Coleman directed attention, for the purpose of showing how the outbreak of war has reacted on the tar distillation industry, to the following table, in which he had gathered together the quotations for the most important tar products given in the first issue of the "Journal of Gas Lighting" for each quarter of the year commencing January, 1914. He took the highest figure in each, and only one quotation for each article, in order to avoid confusion—see table at foot. Proceeding, he said that immediately after the outbreak of war prices were so irregular that for several weeks no quotations were given; but by the beginning of October, 1914, they were being issued again. It should be noted that the quotations for crude tar October, 1914, and January, 1915, were based on the liquid products only. Taking the items in their order, the price of pitch fell considerably. This was due to the stoppage of exports. According to the "Bulletin" issued by the Commercial Intelligence Department of the Board of Trade in October, 1914, during the year 1913 pitch to the value of over one million pounds sterling was exported. Of this, £297,000 worth was sent to Belgium, £472,000 worth to France, £119,200 worth to Italy, and practically none to Germany.

Several proposals have been made to find outlets for the surplus of pitch. Among others, it has been proposed to mix a proportion of it with the coal charged into the gas-retorts. So far the reports as to the results obtained are somewhat conflicting. The most complete report published up to the present is contained in a paper which was read at Birmingham on the 24th ult. by Mr. E. W. Smith, M.Sc.* From a consideration of his figures, it would appear that, so far as gas-works pitch is concerned, this method of disposal can only serve as a means of reducing stocks, and is not likely to continue after the present trouble is over. It has also been suggested that non-coking coal might be rendered fit for coking by adding a proportion of pitch before charging it into the ovens. So far as the author has been able to ascertain, no results have been published; and it would at first sight seem to be unlikely that any great success can be hoped for, since most coking coals lose their coking property when exposed to a temperature of about 400° C. It is possible that low temperature pitches—such as those obtained from producer and blast-furnace tars—may be more suitable for this purpose than those from gas-works and coke-oven tars, as they have been obtained at a lower temperature. It is, however, well worth while giving some time to the investigation of this proposal, as, should success be obtained, it would open out very considerable possibilities. There is, however, one direction which the author thinks holds out considerable promise, and that is the extension of the briquette industry.

Turning next to benzol and toluol, the author said that both have appreciated in value. The former is in demand not only for the production of synthetic phenol, and consequently for picric acid, but it has served as the starting-point for the production of synthetic toluol, and has taken the place of a considerable quantity of petrol as a motor fuel, for which purpose it is excellently suited. Toluol is the starting-point of trinitrotoluol, or "T.N.T.," and the demand has been so great that not only are practically all coke-oven works recovering all the benzol and toluol possible by washing their gas, but the process has been extended to gas-works. When the demand for high explosives decreases, other outlets for these products will have to be found.

The naphthas have advanced considerably in price, but they will probably fall back to their old position again. Creosote has suffered somewhat; but it has a fairly bright future as a fuel for engines of the Diesel type, in addition to its ordinary uses. Carbolic and cresylic acids have risen very considerably, not only because they form the starting-point of picric acid and trinitrocresol, but because of their value as disinfectants. Naphthalene has risen considerably, and will probably maintain a fairly high level, especially as the extension of vertical retorts will tend to decrease its formation.

The rapid increase in the number of works where the process of

* See "Journal," June 27, p. 687.

	1914.				1915.				1916.		
	Jan. 6.	Apr. 7.	July 7.	Oct. 6.	Jan. 5.	Apr. 6.	July 6.	Oct. 5.	Jan. 4.	Apr. 4.	July 4.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Crude tar . . . . . per ton	31 0	29 6	28 3	17 3	18 6	25 0	25 6	24 3	22 6	20 0	19 3
Pitch . . . . . per ton	39 6	37 6	32 6	..	..	18 0	23 0	21 6	16 6	15 6	15 6
90% benzol . . . . . per gall.	1 0	10½	9	10	9	10½	11	11	11½	11½	11½
50/90% benzol. . . . . per gall.	11	10½	10½	10½	1 4	1 4	1 4	1 4	1 4	1 4	1 4
90% toluol . . . . . per gall.	..	11	11	1 3½	2 4	2 4	2 4	2 3	2 3	2 3	2 3
Crude naphtha . . . . per gall.	5½	5½	4¾	5	5¾	5¾	6½	7	7	7	7
Solvent naphtha . . . . per gall.	9¾	9¾	9½	10	1 0	1 7	1 11	2 0	2 0	2 0	1 10
Heavy naphtha . . . . per gall.	9½	9½	9½	1 0	1 0	1 1	1 3	1 3	1 3	1 3	1 3
Creosote . . . . . per gall.	3⅜	3½	3⅜	3½	3 7/16	3⅜	3 11/16	3	2⅞	2⅞	2½
Heavy oil . . . . . per gall.	3¾	4	4⅛	4½	4½	4	4	4	4	4	4
60's carbolic acid. . . . per gall.	1 1½	1 1	1 2	2 2	3 0	3 5	3 6	3 6	3 5	3 4	3 4
95% cresylic acid. . . . per gall.	1 1	1 0	1 0	8	1 4	1 6	2 3	2 6	2 6	2 8	..
Crystal carbolic . . . . per lb.	3½	3⅜	3⅜	..	1 4	1 3	1 6	1 6	1 4	1 4	..
Naphthalene salts . . . per ton	60 0	60 0	60 0	55 0	65 0	75 0	80 0	80 0	80 0	80 0	80 0
Anthracene A . . . . per unit	1¾	1¾	1¾	2	2	2	2	2⅛	2½	2½	2½

distillation is carried out during the last few years has been due not only to the erection of tar distillation plant at coke-oven works, but to the installation of tar dehydrating plant at gas-works for the production of refined tar for use in making and surfacing roads. These plants are mostly small and of the continuous type. The systems of Wilton and Hird appear to be very successful in solving the question of the production of refined tar on the spot where it is required, and saving considerable unnecessary carriage.

As to the future of the actual tar industry, since its birth in this country the methods employed in separating the fractions have followed very largely on the original lines, and the industry has suffered from lack of co-operation among the workers. The author quite realizes the difficulties in the way of such co-operation, but feels sure that if we are to recapture the fine chemical and colour trade from Germany, we must be prepared in the future to give a good deal more scientific attention to the tar industry than has been the case in the past. He briefly indicated some work which might be undertaken by a combination of those engaged in the industry. A central research laboratory might be established where many questions could be thoroughly thrashed out. Meetings might also be held from time to time to discuss ways and means of preventing all useless competition, and conferences might take place with representatives of the gas-making and coke-oven industries to discuss questions of mutual interest. The great need is organization and co-operation, so that we may take advantage of all opportunities of improving the prospects of the industry.

Discussion.

The PRESIDENT said he had some difficulty in understanding why the continuous method of distillation was not more used in this country.

Mr. E. F. HOOPER pointed out that the prices mentioned were not commercial prices in the ordinary acceptation of the term. Among tar distillers, it was quite recognized that benzol or benzene in its various grades would commercially command a very much higher price than was shown. The price indicated was that which the Government required for the delivery of the benzol to them. It was not a question of what they would get for it in the open market. He did not think, with regard to the question of the disposal of pitch in the future, there need be any great searching of heart as to the necessity of putting it back into the retorts and re-converting it into gas and other products. When the war was finished, the normal use of pitch would again find its level. There was a difficulty in England of getting the average manufacturer and chemical producer to run in co-operation with other people—especially with his own particular class of trade.

Mr. R. MACLAURIN said his experience was that in a low-temperature pitch the change from softness to brittleness came very quickly.

EXTRACTION OF TAR FOG FROM HOT GAS.

By G. T. PURVES.

Removing tar fog from hot gas, said Mr. Purves, is seemingly an operation of considerably more difficulty than complete extraction from cooled gas. It is a question which has arisen only in comparatively recent carbonizing practice. In direct recovery systems, the gas must be freed from tar fog before it enters the saturators, thus reversing the order of arrangement on the older indirect system. In the separation of tar fog from hot gas, the expenditure of energy is very considerable.

The fundamental factor in tar extraction appears to be the control of the cooling; and in order to get the maximum tar separation in the mains, the gas must be cooled as early as possible to as near the minimum temperature required as is practicable. This is particularly important where hot tar extraction is to be carried out; for the fog which is formed just before the extractor is entered is very difficult to remove. It should be advantageous to cool the gas to practically the extraction temperature, then pass it through a long main carefully insulated to prevent further cooling, and then into the extractor. Lowering the temperature of the gas materially below that at which the fog is formed certainly facilitates extraction. In indirect recovery practice, where the gas is completely cooled, such a machine as a Livesey washer or a Pelouze and Audouin tar-extractor, which gives a very simple scrubbing action, effects satisfactory extraction for the works purpose. They are not, however, suitable for treating hot gas.

METHODS OF EXTRACTION IN USE.

The ordinary devices used for fog extraction being ineffective, special methods have been applied, which give a much more intense scrubbing action. On the Simon-Carvès direct recovery plant, the heavier fog is separated in a "Cyclone" extractor into the inlet of which a jet of ammoniacal liquor is forced. The principal extractor, however, which removes the lighter fog, is a "Dynamic" separator, the vanes of which revolve at high speed. The author has no experience of this type of extractor, but he has passed crude gas at 80° C. through a five-fan turbo-exhauster, running up to 2000 revolutions per minute; and although the extraction was not complete, the bulk of the fog present was removed. The exhauster was not specially designed on the lines of a dynamic extractor. The result of this test inclines him to the view that, with such an exhauster working on cooled gas, special tar-extractors might not be necessary. The energy required in a dynamic extractor is said to be 1 H.P. per 12,000 cubic feet of gas per hour—presumably crude gas passing through the separator. When carbonizing wet dross, the volume of crude gas produced measured at the dew-point will not likely be less than 20,000 cubic feet per ton; so that on a 360-ton plant the energy required per day will be about 600 H.P.

The method of extraction patented by the Otto-Hilgenstock Company was to scrub the gas with a spray of tar. A cluster of sprays was used in Germany, and was so arranged that any particular number of sprays could be used at once. This practice was not exactly followed by the Otto Company in this country. The plant they erected at Auchengeich has four sprays, and provision is left for adding two others. These sprays can be worked singly or two sets of two in series. They are served by a motor-driven centrifugal pump, the capacity of which at high pressure is 120 cubic metres of tar per hour; and they are designed for treating the gas from 360 tons of coal per day. Before handing over the plant the Otto Company gave up the use of tar, and used instead a mixture of tar and liquor. They also used only one spray. The author prefers to use liquor as free as possible from tar, and a much smaller volume than that given above. The energy required at present per day is 360 H.P. These figures show, in the designer's view, at least, the magnitude of the difficulty of completely removing the tar fog from hot gas.

SPRAY EXTRACTOR EXPERIMENTS.

Following on treatment of the gas as regards the rate of cooling, Mr. Purves has, with a view to saving energy, made experiments on the spray extractor itself, varying the dimensions of it, the nature of the liquid used, and the pressure and volume of the liquid. The spray is applied inside a tapered pipe, which is narrower at the top than the bottom; the spray and the gas both passing downward through this pipe or throat. Unless the throat is partially drowned with an excessive amount of liquor, the extractor does some work as an exhauster, and so a considerable saving is effected at the exhauster proper. This shows that the spray is pushing the gas in front of it, when, for efficient scrubbing, it should pass through the gas, beating out the tar particles in its passage. From this we conclude an excessive amount of liquor is being used; and a saving in energy will be effected by reducing this volume, provided we can suitably apply the smaller volume to get the same extracting efficiency.

Now consider the action of the Pelouze tar-extractor, where the gas divided into small streams flows against an obstructing surface. We see that the efficiency of extraction will be determined by the fineness of the gas streams, and their relative velocity to the obstructing surface. It will come to the same thing if we consider small obstructing surfaces to be driven against the gas, with the same relative velocity, so dividing it into small streams. The efficiency will be increased if these obstructions are made smaller and placed closer together, and at the same time driven faster. We should very soon reach the limit at which the machine would be practical to construct and maintain. But this construction we are seeking is precisely what we have in a spray extractor. Thus we see the factors which determine the extracting power of the spray, and the lines along which increased efficiency must be sought. It is to be noted that this fine pulverizing of the spray is quite contrary to the practice of pumping relatively enormous volumes of liquor down the throat. The velocity of the particles of spray is determined by the pumping pressure. The fine subdivision of the spray is influenced by the pressure, but more particularly by the design of the spray nozzle. While considerable evidence is available regarding the discharge of liquid in solid jets from sharp edged orifices, there does not seem to have been much work done on the sprays formed when using orifices which cause the jet to burst. Experiment is therefore required to find the type of nozzle which will give the best spray. It is on the lines indicated that the author has been experimenting; and while the results so far are very promising, he has not yet sufficient data to refer to in more detail. As a result, however, he is hopeful that efficient extraction will be got with a further saving of possibly 70 to 90 per cent. in energy.

FRACTIONAL COLLECTION OF TAR.

While hot tar extraction is an essential to direct recovery, it is also the key factor to a further lucrative possibility in carbonizing—*i. e.*, the fractional collection of tar. It is to be expected that in future the recovery of benzol and its homologues will be carried out at gas and coke works to a greater extent than hitherto. This leads to the question of what is to be the standard practice. Are we to distil the tar produced in bulk by completely cooling the gas for one portion, and wash the gas for the remainder, or shall we adopt the more rational practice of simply washing the gas, and in this manner recover the whole benzol content in one operation? If the latter course is adopted, the tar fog must be removed from the hot gas, and probably the ammonia recovered by a direct, or at least semi-direct, recovery process. When direct ammonia recovery is practised a small tar fraction is separated, when the gas is completely cooled before washing with creosote. This fraction consists of naphthalene, together with phenols and some heavy naphtha. We have thus a marked step towards complete fractional collection of tar; and it is surely a natural development to complete the fractional collection. It appears to the author that all the arguments which justify the production of ammonium sulphate direct, instead of through the intermediary of a crude liquor, also justify the production of tar products in primary fractions without the intermediary of a crude

tar. Further than this, there is the question of the nature of the tar products themselves to be considered.

The tars produced in the modern vertical retort differ greatly from those produced in horizontals and coke ovens. They, in fact, mark a step towards those produced in so-called low-temperature carbonization, and to which we may soon be giving much more attention. Tars widely dissimilar are mixed at the tar distillery, and submitted to uniform treatment. It may not be practicable for tar distillers to deal with the different types of tar separately; but there does seem good reason for giving them selective treatment, and if fractional collection was adopted at the carbonizing works each tar could receive the fractional separation most suited to its composition. Both anthracene and solid paraffins are valuable products, and well worth recovering; but when the tars are mixed, the one substance fouls the other. Vertical-retort tar, particularly when mixed with other heavier tars, might be expected to suffer more from decomposition during distillation, since it has not been cracked to the same extent during carbonization of the coal. Specifically light tars yield more gas when they are being distilled.

Discussion.

Mr. PURVES, in reply to criticism, pointed out that the figure of 360-H.P. mentioned in his paper was, in his opinion, far too large in hot-tar extraction. But when it was cooled down, it was entirely different.

THE SHALE-OIL INDUSTRY.

By D. R. STEUART.

In the course of a paper containing many interesting details in connection with shale-oil mining and refining, Mr. D. R. Steuart said that, if it had not been for ammonia, the industry would have ceased to exist long ago. In the early days, burning oil was the principal product; and when this country was flooded with foreign lamp oil, the retorts were changed to make heavy oil and solid paraffin. By and by, when these came in in great quantities, the retorts were lengthened so as to increase the sulphate of ammonia. The yield of sulphate was trebled. But with gas-works, gas-producer plants, iron-works, and coke-works all producing ammonia, and with Niagara and the waterfalls of the world harnessed-up to create combined nitrogen from the atmosphere, there is nothing left to fall back upon, except, perhaps, that we may educate our farmers to use more ammonia, and so increase the demand.

No doubt home-made sulphate of ammonia is a better and safer manure than foreign nitrate of soda, if only it be applied at the right time, and the soil be kept neutral with small doses of lime. Nitrate tends to kill off the beneficent microbes in the soil that produce plant food, and ammonia encourages their increase. Nitrate is easily washed out of the soil. A field at Rothamstead by last winter's rainfall lost nitrate equal to some 7 cwt. of nitrate of soda per acre.

About 1880, when Peruvian guano got scarce, the price of sulphate was £22, and even £24, per ton. By 1890, nitrate was imported in such quantities that the price fell to £8 per ton; but the demand increased in proportion, and the price secured for many years was £12 to £14. With Government and Parliament taking an interest in science, the author thinks the demand may increase with the supply, and a price be obtained that may keep this industry still in existence and able to pay a dividend.

BRITISH COAL-TAR COLOUR INDUSTRY AND ITS DIFFICULTIES IN WAR TIME.

By C. M. WHITTAKER, B.Sc., of British Dyes Limited.

In the course of a lecture, Mr. C. M. Whittaker dealt with the handicaps under which the British coal-tar colour industry has been, and is, labouring. One of the greatest handicaps, he said, has been the shortage of *personnel*. On the outbreak of war it is to be doubted if there were twenty British chemists who had had actual up-to-date experience on the commercial scale in the manufacture of coal-tar colours. Of those who had had experience, some had their energies diverted to the manufacture of explosives to the detriment of coal-tar colour manufacture. This was an inevitable result of the close interrelation between high explosives and coal-tar colours. No complaint is made of the diversion of this energy; but it requires to be stated as one of the definite handicaps of the industry during war time. There was no reservoir of trained *personnel* from which to draw; so that university trained men of good theoretical knowledge but no practical experience have had to be taken; and naturally some time must elapse before they become adapted to their new conditions.

The outbreak of war, bringing in its train the enormous demand for supplies of high explosives on a scale hitherto not contemplated, illustrated how closely interrelated were coal-tar colour and high explosives manufacture. The two high explosives most largely in use are picric acid (or trinitrophenol) and trinitrotoluol. The latter requires similar apparatus to that which is used for nitro bodies like nitro benzol, so essential in coal-tar colour manufacture. The contributions being made to the supply of munitions by the engineering trade have made it a slower process getting delivery of the plant for necessary extensions. The same conditions have produced a shortage in skilled fitters necessary for the erection of the plant when delivered; while a similar remark applies to the erection of the buildings in which to place the plant. In fact, the shortage of labour confronts one at every turn. Copper and lead also enter largely into the apparatus used in coal-tar colour manufacture, which, at present prices, adds enormously to the cost of such plant.

Trinitrotoluol and trinitrophenol each contains three nitro groups; and therefore their manufacture inevitably requires a large amount of nitric acid coupled with the sulphuric acid which is always used in the manufacture of these nitro bodies. The life blood of the coal-tar colour industry is sulphuric acid—both fuming sulphuric acid, and nitric acid. It is the misfortune of colour manufacture that it is impossible to make any colour without the use of nitric and sulphuric acids. These self-same acids are also indispensable for the manufacture of the two high explosives, lyddite and T.N.T. In this fact lies the greatest handicap of the British coal-tar colour industry, because, as is well known by every acid consumer, the supply of acids is nothing like equal to the demand.

The author said that a prevalent question in peoples mind is, "We can understand you not being able to make some of the German specialities; but we cannot understand you not being able to supply certain old colours whose constitution and method of manufacture have now been known for so many years." The reason of this is convincingly demonstrated. The colours referred to are not being made freely at the present time, not through inability of British chemists to manufacture them, but owing to the necessary products not being available, in consequence of them being required for more important processes. In certain directions, the supply of colours has been very large; and khaki uniforms dyed with mordant yellow, brown, and green of British manufacture are equally as fast to light, exposure, and wear as any similar cloth that was previously delivered to the British Government dyed with German colours. The British firms have every reason to be proud of their products for this purpose; and the day is past when it is necessary to stipulate German colours in British khaki specifications.

The shortage of acid in this country, the author concluded, is in course of being rectified; and there is no after-effect of the war which may be prophesied with more certainty than that there will be an abundant supply of acids in peace time. Plant for the manufacture of colour on a scale never hitherto attempted in Great Britain is being erected as fast as is humanly possible. Research also is being organized on a scale hitherto not attempted; so that the neglect of research may not in future be counted against the British firms as one of their sins of omission. In fact, when the colour consumers of this country come to weigh the efforts which have been made for them by the staffs of the colour firms of this country—from directors down to the humblest colour tester—they will be amazed at the success of these efforts.

The task before the British industry is inestimably difficult, because the Germans have formed a huge combination, with £11,000,000 capital, to fight the British efforts, which at first they treated with contempt. On what lines the Germans will be allowed to compete, the future will decide. This opposition is most formidable, formed as it is of the cream of the German colour firms, with forty years' experience behind them. Nevertheless, the British chemist is being given a chance for the first time to fight the German chemist with anything like equality of opportunity. Speaking for my own colleagues, we welcome the fight, in order to show that British chemists are equal to German chemists. The fight will be a stiff one—none know this better than those few British chemists who battled against the Germans in peace times. In the past British firms fought in a very antagonistic atmosphere, in the cultivation of which some scientific societies were not free from blame. What the British industry requires is sympathy and patience—the handicap of forty years is sufficiently heavy to warrant it. If we must have criticism, do not let it be destructive criticism—anybody can furnish that—but let it be constructive criticism founded on knowledge.

Discussion.

Mr. THOMPSON thought that the German Government was much more liberal than the British Government in regard to patent matters.

Mr. R. D. PULLAR gave it as his opinion that if British chemists and British dyes could not succeed on their own excellencies, they could not succeed at all. It ought to be generally known that British dyes were actually sold in Germany previous to the war.

Mr. WHITTAKER suggested that the subject of co-operation should be dealt with in one of the papers at the next conference. From what he had seen of co-operation among manufacturers, in a short time they would be able to spell co-operation in just five letters—Trust.

OPPORTUNITY OF THE BRITISH CHEMICAL INDUSTRY.

By F. H. CARR.

Dealing with the "Manufacture of Synthetic Organic Drugs as Affected by the War," Mr. F. H. Carr pointed out that the present opportunity is unique. Great Britain, the home of coal tar and the birthplace of chemical industry, is at least as favourably situated as any country for the manufacture of organic chemicals. Furthermore, if given time, the industry can be established upon a basis of complete independence suitable for the conditions of free trade. But it is our duty to admit frankly to-day that some

form of protection is of vital necessity during the coming ten years, while we develop a complete organization, and rectify educational shortcomings. Without this protection, what has already been accomplished will rapidly and completely be demolished by competition from abroad. The recent announcements of the combination of all leading German chemical works will not have escaped attention. A declaration of war on the chemical manufacturers of this and the allied countries is definite and unmistakable. Enough is known of German methods to make it obvious that for no object will German industry and organization, directed from the highest quarter, and financed from the nation's purse, be more ruthlessly employed after the war than to recover, consolidate, and extend the hold formerly possessed over the world's chemical industries.

Important though protection is, nothing is more certain than that without some similar combination, organization, and national assistance, no form of protection will, by itself, enable the British chemical industry to hold its own in the world's markets, and eventually in its own. No opportunity should be lost of impressing upon the nation and its rulers the fact that the possession of a powerful and self-contained chemical industry is of the same degree of importance as that of a great engineering industry has proved to be. Surely there is no more urgent requirement of the Association of Chemical Manufacturers than that it should bring together the smallest and largest workers in this field frankly to discuss the measures to be taken to ensure their future progress; and that it should bring such influence to bear upon the Government, either directly or through the Board of Trade, as will secure the necessary legislation. It must be said that the absence from among the Board of Trade Committees, dealing with post-war problems, of any to deal with the chemical industries, is of ominous import. Never was the need of a united chemical "voice" more imperative than now.

Messrs. Hill and Morson, in a paper on the "Manufacture of Fine Chemicals in Relation to the British Chemical Industry," remarked that it is an interesting comment on the importance which is attached to the chemical industry by the public and official mind, to reflect that no Board of Trade Committee has yet been appointed to inquire into the after-war-conditions with which the chemical trade of this country will be faced. Committees for the textile, iron and steel, electrical, shipping, and ship-building industries have already been appointed, and have made recommendations as to the steps which should be taken to meet the new conditions arising out of the war. To these industries, as well as to many others, it is vitally important that a flourishing chemical industry should exist in this country. Certainly as regards the fine chemical industry it seems highly desirable that a Board of Trade inquiry should be instituted to inquire into the problems with which the whole industry is faced, and to receive the views of representatives of the trade as to the steps which should be taken to meet the new conditions.

PROGRESS OF THE BRITISH RARE EARTH INDUSTRY DURING THE WAR.

By Sydney J. Johnstone, B.Sc. (Lond.), Scientific and Technical Department, Imperial Institute.

In a paper on the subject of the progress of the British rare earth industry during the war, Mr. Johnstone remarked that it has undergone several extreme changes during the past two years, varying from a serious shortage of most of the necessary raw materials at the outbreak of war to the present position, which is full of promise for our future independence of foreign raw materials.

During 1913, the estimated consumption of incandescent gas-mantles in the United Kingdom amounted to about 100,000,000; and of these probably about 60,000,000, valued at nearly £200,000, were imported from Germany. In addition, there was also imported thorium nitrate to the value of £41,544. Some ten years ago, certain firms in Germany obtained a monopoly of the most important deposits of monazite sands; and the serious shortage of thorium nitrate which occurred on the outbreak of war led British chemical and incandescent mantle manufacturers to look into the question of obtaining adequate supplies of monazite sand, in order to make thorium nitrate in this country. The only known deposits of monazite sand of any commercial importance are those worked on the coast of Brazil and in Travancore, India—the latter sand being of considerably greater value, on account of its higher content of thoria. During the past year, a considerable quantity of Travancore sand has gone to the United States for treatment; and many of our incandescent mantle manufacturers have had to depend recently on supplies of thorium nitrate from this source. It is satisfactory, however, to record that at least four British incandescent mantle firms are making thorium and cerium nitrates from Travancore sand, in sufficient quantity for their own requirements.

If we assume that the quantity of mantles used in the United Kingdom during a normal year is 100,000,000, and that each contains on the average 0·5 grm. of thoria, then the annual consumption of Travancore monazite for this purpose would be about 650 tons, assuming 8·5 per cent. of thoria in the sand and a recovery of 90 per cent. It is evident that the incandescent mantle trade in the United Kingdom is not able, at the present time, to utilize the thorium nitrate obtainable from a normal year's output from Travancore, and that we must either make a strong bid for a very large share of the world's thorium nitrate and incandescent mantle trade, or see these important resources of monazite sand within our Empire utilized by other nations.

The effect of the shortage of raw material shortly after the outbreak of war was not noticeable to the general public, as enormous quantities of incandescent mantles were imported from Holland. But it was evident that they were largely German produce repacked or branded in Holland. As a result of inquiries, and the enforcement of the order prohibiting the import of goods containing more than 25 per cent. in value of raw material of enemy origin, a number of consignments were condemned. The quantity imported from Holland has now been reduced to a more normal amount. As that country in ordinary times does not produce sufficient gas-mantles to supply a fraction of her own consumption, it is difficult to see how any considerable quantity of mantles made in the country, and satisfying the above condition as to origin of material, could be available for export. It is probable that attempts will be made to get German-made mantles into this country during the war through other channels. British incandescent mantle makers, on the whole, report that they find it is difficult to keep pace with all the home trade offered, in spite of the reduced consumption for public lighting. Several state that their export trade—particularly to the British Colonies and to South America—has very largely increased.

In the past this country has had to depend largely on foreign countries for its supplies of a number of articles into the manufacture of which the rare earths enter; and even in the cases where the article was made in this country, the manufacturers had to depend almost entirely on foreign countries for supplies of partly manufactured material. There does not appear to be any reason why this state of things should again prevail after the war. All the necessary raw materials are available in adequate quantities within the British Empire itself; and most of the difficulties in converting the raw materials into appropriate form have been surmounted. The conditions arising out of the war have rendered it necessary for us to commence the manufacture of our supplies; and it is to be hoped that the great progress already made will be continued.

It is quite certain that the powerful German firms who, prior to the war, exercised such a considerable control over the lighting industry, both as regards incandescent gas-mantles and incandescent electric lamps, will not accept, without a struggle, the position created by British enterprise during the war. These new British industries may therefore require Government assistance, either direct or indirect, to maintain their position when peace is declared. In this connection, it is most important to remember that there is no reason to suppose that Germany has exhausted her reserve supplies of Brazilian monazite stored before the war; and even when these are used up, she will still hold the concessions to work large deposits of the mineral in Brazil until 1927.

Discussion.

Professor Louis said that, whereas German industries could get all the support they wanted from their banks, help of the same kind could not be secured in this country. He saw no reason why, without losing our old-established banking system, there could not be a new system of industrial banking, which should make its specific object the assistance of industries.

THE MACLAURIN LOW-TEMPERATURE DISTILLATION PROCESS.

Included among the exhibits, was a collection of samples of products from the Maclaurin low-temperature distillation process, shown by permission of the Glasgow Corporation Gas and Electricity Departments. In the official catalogue of the exhibition, the following notes appeared with regard to this process.

The essential difference between the Maclaurin process and all other low-temperature distillation processes is the entire absence of any system of external heating. The producer from which the products exhibited are obtained is practically a blast-furnace 30 feet high by about 8 feet in diameter. At the top, provision is made by which the oils condensing on the upper layers of fuel are trapped and run off, and thereby prevented from finding their way into the regions of combustion below, where decomposition would ensue. Combustion is maintained by an air and steam blast, and the cooling of the power gas formed provides all the heat necessary for carbonizing the incoming fuel. Each piece of fuel is fully twenty-four hours in passing from atmospheric temperature to a temperature of about 750° C. The perfect carbonization of the coal from surface to centre is due to this slow process of heating. The oils are partly washed out of the coal by the stream of condensing oil, and partly distilled over by the current of hot gas and steam. The oils are carried forward at the lowest temperature at which they can be evolved, and never pass through fuel at a higher temperature than this.

Practically no decomposition takes place, as is evidenced by the almost entire absence of non-condensible hydrocarbons in the gas—the quantity of methane even being surprisingly low. The crude oil dries hard like linseed oil when mixed with oxidizing bodies. The resins either come from the coal direct or are formed by the action of aldehydes on the phenols. The oil shows itself as an excellent lubricant when tested on the friction machine, though

it has no appreciable viscosity. From one-third to two-thirds of the nitrogen of the coal is obtained as ammonia.

The gas contains the bulk of the heat of the fixed carbon of the fuel; the loss of heat in the process amounting to between 15 and 20 per cent. when allowance is made for the heat units contained in the oil.

Concluding Business.

A vote of thanks to the Edinburgh University Union and to Mr. J. P. Longstaff, of the Chemistry Department of the University, for the admirable way in which they had made arrangements for the meeting, was unanimously carried; and a hearty vote of thanks was also accorded to Mr. Carpenter for presiding.

On Friday afternoon, visits were paid by the delegates to the works of the Pumpherston Oil Company, the North British Rubber Company, and Messrs. M'Vitie and Price's biscuit works.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Testing of Gas-Heated Cookers.

Sir,—In your issue of the 11th inst., an article by my client, Mr. Stanley S. Farrar, appeared, dealing with a new method of comparing results of tests of gas-cookers which he had himself worked out.

Unfortunately, to illustrate the article, Mr. Farrar inadvertently made use of data which he had collected while in the service of Messrs. John Wright and Co., and did not before using the figures obtain the consent of Messrs. Wright.

By arrangement with Messrs. Wright's Solicitors, I send you herewith a letter, signed by Mr. Farrar, who will be obliged if you will insert the same in your issue of this week.

Ernest Ward, Solicitor.

29, *Temple Row, Birmingham,*
July 24, 1916.

[Enclosure.]

50, Holly Road, Handsworth,
July 24, 1916.

Dear Sirs,—I understand that you complain of an article appearing under my name in the issue of the "Journal of Gas Lighting" of the 11th of July, wherein I make use of certain data obtained by me while in your employ in connection with experiments made on your instructions and those of your Chief Chemist.

I admit that the data in question were collected by me while in your employ, and should not have been used or communicated without your permission. I assure you that the omission on my part was inadvertent; for when I wrote the article I did not realize, as I now do, how the communication and publication might act to the disadvantage of the business interests of your Company. I shall, therefore, be grateful if you will accept my sincere apology for my action, instead of instituting proceedings against me for an injunction and damages.

You may accept this as my absolute assurance that I have not, neither will I in the future, without your written authority, make public or communicate to any one any data, material, or information obtained by me when in your service; and I will, of course, pay your Solicitors' charges.—Yours faithfully,

Stanley C. Farrar.

To Messrs. John Wright and Eagle Range, Ltd.,
Essex Works, Aston, Birmingham.

Diluted Coal Gas.

Sir,—Like Mr. Glover, I have received several expressions of approval from gas engineers at my attitude on the above subject; and there for the present I must leave the matter, which is not easy of public discussion at the best of times.

It is quite possible that the variance of opinion which exists arises from the fact that different gas undertakings are differently circumstanced. For instance, some may not be working competitively, as for example when there is joint ownership of gas and electric supplies. Others, for reasons which need not now be discussed, may have largely lost their lighting load. In still further instances, the sheer simplicity of flat-flame gas-burners has resulted in their continued use in large quantities.

I suggest that these variables should be taken into consideration by the gas engineer when he is deciding the course he will follow.

Charles Carpenter.

709, *Old Kent Road, S.E., July* 22, 1916.

Gas Engineers and Contractors.

Sir,—Following up the article printed in last week's "Journal" (p. 111), it might perhaps be well to mention that I do not say that the whole body of gas managers, without exception, are ignorant of engineering proper, but that the great majority of them are so, and have no real engineering training. What the gas industry wants, or should want, is to draw into its service young men who have served a pupilage in the much higher branches of engineering—the best shops and offices—young men who have likewise had good scientific training.

I do not underrate the experience necessary to be obtained in the gas contractors' service (works and offices and at gas-works), nor in gas-works. It goes without saying that these are of the greatest importance.

F. S. Cripps.

St. Stephen's House, Westminster, July 19, 1916.

[In sending the above remarks for publication, Mr. Cripps points out that there was an error in the eleventh line from the bottom of the second column of p. 111—the word "effecting" being printed as "affecting." The passage is here given as it should have appeared: "The gas manager is the man to determine the process; the contractor, the man to provide the apparatus for *effecting* it."—Ed. J.G.L.]

The Gas Trade—After the War.

Sir,—To one who has for some years been more or less of an onlooker of movements in the gas industry, the admirably conceived leading articles, and communications arising out of them, in recent issues of the "Journal," upon the subject of "Traders," gas engineers and contractors, and the future organization of the gas industry, are full of interest.

Your confident cry: "A 'New Age!' It will be a new world on which we shall look out immediately after the war; a new life in which we shall have part," undoubtedly voices a widespread belief, and echoes a deep-founded hope. Your frank recognition of the fundamental changes that have occurred, and the golden opportunity that is presenting itself to turn them to good account in the gas industry, is deserving of all praise. But the opportunity must first be understood, and then seized and turned to full advantage by practical hands. Otherwise it will be frittered away in sounding phrases and good intentions.

We are fighting a war for the triumph of ideals and for the right of democratic freedom. These aspirations, it seems to me, must also be accepted and acted upon by those in the gas industry, if it is, as you so well put it, to take its highest place "in that new world and new life." How is this, in part at least, to be achieved? I would submit that, in the first place, there must be a drastic discarding of previous prejudices and preconceived notions; so that new problems can be approached with free and open minds. There must be a shedding of the petty aims and narrow exclusiveness of former times. The selfish inquiry of "What will it profit me?" must be replaced by the wider test of "Will it increase the efficiency of the industry?" and "Will it strengthen the State?"

The representative Institution of this invigorated gas industry should be as all-embracing in its membership as it should be wide in its scope. It should, I suggest, include every one who by training and experience could add to its representative influence and power—from the coal dealer to the gas sundries supplier. There should be no false class distinction. I was once on a Committee called by the Institution of Gas Engineers to consider the advisability of enlarging its membership. I advocated opening the doors as widely as possible. That was opposed by certain men whose opinions you rightly describe as "petrified." That Committee, as far as I am aware, met but once, accomplished nothing, and I do not know what became of it. Theoretically, for all I know, it may still be in existence.

It appears to me that any future British Gas Institute must be broadly based, and fully equipped with the proper organizing staff, if it is to do its work in the after-war trade. I would suggest that the existing departmental societies might well continue their work; but that they should have representatives on the Council of the new Institute. This should ensure co-ordination of effort, without curtailing the authority of the Central Council. The important thing is to have a body of undisputed and recognized influence and power to represent the gas trade as a whole, and able, as and when required, to act forcibly as a whole homogeneous body. For instance, I do not know what, if anything, is now being done to prepare for the reconstruction work that will be urgently required in the rehabilitation of the gas undertakings laid waste by the war. Surely this should not be left to the grab of the individual, or the haphazardness of hurried competition. I would suggest, it should be controlled, in outline at least, by an organized body representing the parties likely to be concerned. The Society of British Gas Industries might, I think, perform a very useful service by collectively considering the problems involved, and by getting into touch as far as possible with representative gas societies in the countries affected. This is only one instance among many that will occur to everyone of the present and future opportunities for organized effort in the gas industry.

There is, I feel sure, all around an atmosphere of expectancy, of happy optimism, of ready willingness to help in industrial and social reconstruction and improvement. Those in the gas industry should share in this; and I believe the opportunity, if grasped, is at hand. In so far as it has the courage to shake off its past shackles of petty jealousies and isolated exclusiveness, and to organize for greater and broader effort, so far, I believe, will it add vastly to the prestige and status of its members, and increase its usefulness to the community, and strengthen the efficiency of the State.

C. E. Brackenbury.

Temple, July 23, 1916.

Sir,—Your columns have contained notable letters of late relating to the closer organization of the various sections of the gas industry; and doubtless the opinion of one of the lesser lights may add to the interest of the discussion.

While many improvements have followed the efforts of the past few years—although progress has not by any means been confined to that period—it will be apparent to all who closely read the "Journal" that serious differences of opinion upon important matters still obtain. Particularly among manufacturers of gas-consuming apparatus is this fact noticeable. Every concern appears to work in its own groove; and when a policy of construction is decided upon, the work involved in preparing for its trade commits that concern to a definite line of activity for a season at least. Until that period is over, every effort is naturally made in order to justify the course embarked upon; and the different views advocated by the respective makers and their nominees must add further perplexity to the lot of the distributing engineers who handle their goods.

One way out of this unsatisfactory position seems to be by the admission of the inside officials of the manufacturing concerns to membership of the various Associations of Gas Engineers. Such a step would tend to bring all the engineers in the industry together; for it

cannot be reasonably held that the only gas engineers in the country are those engaged in gas manufacture.

What is perhaps of greater importance is that an opportunity would be provided for the officials who are responsible for the design and production of apparatus to meet upon common ground—a condition which does not unfortunately obtain at present.

A monopoly of knowledge is not possessed by any individual, nor any group of workers. Each has its respective advantages and difficulties to deal with. If the respective schools of thought were to be brought together (and the Associations of Gas Engineers would be able to do so), the way for more rapid progress would quickly be cleared.

The position only calls for an extended application of the broad-mindedness which is now apparent among many of the leaders of the gas industry in other directions.

INELIGIBLE.

July 23, 1916.

REGISTER OF PATENTS.

Settings of Gas-Retorts.—No. 100,628.

CARPENTER, H. A., and the RITER-CONLEY MANUFACTURING COMPANY, of Leetsdale, Allegheny, U.S.A.

No. 8507; June 8, 1915.

This invention relates to the settings of retorts for carbonizing coal, with the object of restricting losses due to leakage by the use of an enclosing metallic casing for the refractory mass structure, and providing "a mass structure and casing in which the effects of expansion in bringing the apparatus to the working temperature will be compensated for."

According to the main feature of the invention, the "refractory mass structure" in which the retorts are arranged is enclosed within an expansible metallic casing—the structure and casing being "each arranged as a separate entity and being free from interengagement of parts, so that each is capable of freely expanding under the action of the heat and is entirely unaffected by the expansion action of the other."

According to another feature of the invention, the casing is spaced from the mass structure a distance sufficient to allow for independent expansion action of the structure, and a lining of heat insulating material is interposed between the structure and the casing and is compressible under the expansion action of the structure. The lining is preferably formed of a diatomaceous earth, such as kieselguhr.

A further feature of the invention consists in that the mouthpieces of the retorts are carried by the casing, and are so positioned thereon that they are out of alignment with the respective retorts during the assemblage of the apparatus, but are brought into alignment with the retorts due to the expansion of the mass structure when the apparatus reaches its working temperature.

Other features of the invention were pointed out in the course of the paper recently read by Mr. John West before the Manchester District Institution of Gas Engineers.

Regulating and Measuring the Proportional Flow of Liquids and Gases.

LEA, J. E., of Manchester.

No. 9067; June 21, 1915.

This invention, referring to the proportional regulation of the flow of liquids or liquids and gases, will be of use in the proportional regulation of the "make-up" water in water-cooling towers; while another use will be in the proportional mixing of two different liquids, which require to be blended in certain definite proportions. A further use will be in the proportional regulation of a gas requiring to be added to a liquid.

The chief feature of the invention is a motion rectifying device or appliance of cam, screw, wedge, or like formation, the contour of which embodies the formulæ of the rates of flow of the two liquids or liquids and gases to be proportionally regulated. The appliance is operated by a float or valve spindle, the motion of which is the measure of the amount of one liquid; while the cam (in turn) imparts motion to a valve, the opening or movement of which is the measure of the amount of the other liquid or gas.

The patentee claims: In the proportional regulation of two liquids, or a liquid and a gas, the employment of a cam and means whereby it may be operated by one liquid while flowing through a V notch, or over a weir, in combination with a valve for controlling the flow of the other liquid or gas. The cam embodies the formulæ of the "rates of flow" of the liquid or gas flowing through the V notch or weir, and also the "rates of flow" of the liquid or gas flowing through the orifice controlled by the valve, and means whereby the movements of the cam are automatically imparted to the valve to open or close it in such a manner as to cause the liquid or gas passing through the orifice controlled by the valve to be increased or decreased to an extent exactly proportional to the other liquid or gas, as set forth.

Rotary Engines, Pumps, Meters, and Blowers.

LILLY, W. E., of Dublin.

No. 9359; June 25, 1915.

This invention relates to apparatus which comprises an outer wheel internally chambered in mesh with an inner wheel externally chambered—the two wheels differing from one another in size and in the number of teeth, so that chambers are provided between the teeth into which fluid under pressure can be admitted for the purpose of driving the engine. The object aimed at is to provide a construction in which, when the angular motion of one of the wheels is uniform, the angular motion of the other moving part or parts is also uniform, so that the engine may run satisfactorily at very high speeds. A further object is to equalize the wear on the teeth, so that their effective life is increased.

The teeth of both inner and outer wheels are made true cycloids, and are shaped to a rolling circle having a diameter intermediate of the diameters of the pitch circles of the inner and outer wheels. The teeth upon one wheel may be smaller than those on the other; but it "is essential that they should be of a substantial size to present a wearing surface to the teeth with which they mesh." It is preferable that the teeth of both wheels should be of substantially equal size; and to this end the rolling circle preferably has a diameter equal, or approximately equal, to the arithmetic mean of the diameters of the pitch circles.

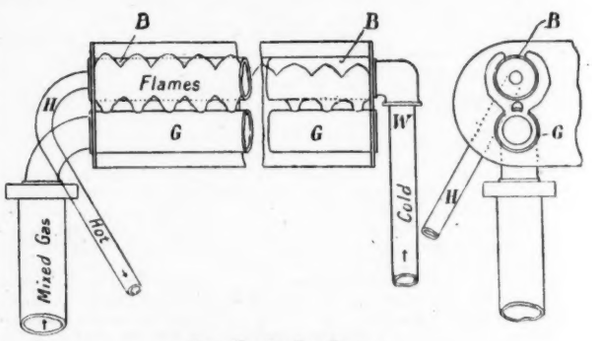
Geyser or Continuous Water-Heater.

BROMHEAD, H. K., of Glasgow.

No. 10,859; July 27, 1915.

In this invention the water is passed along a tube or channel which has below it a tube that is continuously perforated by holes or burners and is supplied with gas which gives up "the whole of the heat progressively to the water as its temperature is progressively rising."

The heat is progressively increased in many ways: (A). By progressively increasing the size of the openings in the burner-tube G, so that the flames will be greatest towards the issuing point of the water. (B). By fixing the burner-tube G at an incline, higher near the water-issuing end, so that the ascending power of the gas will cause it to issue more freely at the higher level and make the flames higher there.



Bromhead's Gas Geyser.

Consequently, part of the claim made for the invention is for "the principle of progressively increasing the heat, not in any particular way, but in any progressively increasing manner that may be considered practicable in any particular size of the apparatus and in any special case."

In the illustration, W is the cold-water inlet; B is the boiler; H is the hot-water outlet; G is the gas-burner. The front view is "shown in two parts, indicating that the length varies, according to individual requirement."

Elimination of Sulphur Compounds from Benzene.

WILSON, J. A., of Chesterfield.

No. 14,152; Oct. 6, 1915.

This invention relates to a process for the purification of benzene from sulphur compounds, with more particular reference to the portion of the sulphur impurities which exists as carbon disulphide.

It is well known, the patentee points out, that for many of the purposes for which benzene is used, the presence of sulphur compounds is highly objectionable. The methods hitherto adopted for removing these compounds have varied according to their nature. Nearly the whole of the sulphur in benzene is present in the two forms of carbon disulphide and thiophene. The sulphur, in combination as thiophene, can be, and where necessary is, removed by repeated washings with concentrated sulphuric acid; but so far no method has been generally adopted for removing the carbon disulphide other than the partial one of concentrating it in the first portion—known to the trade as "fronts"—of the distillate on rectification. This procedure involves the production of a more or less appreciable amount of benzene highly charged with carbon disulphide, for which a market is difficult to find. Attempts have been made from time to time to eliminate the carbon disulphide by treating the benzene with potassium permanganate, litharge, and other substances, but with little or no success.

The present invention consists in utilizing, under certain defined conditions, the reaction which takes place between sodium (or potassium) hydroxide and carbon disulphide, as follows:

$$6NaHO+3CS_2=2Na_2CS_3+3HzO+Na_2CO_3.$$

To this end the invention consists in bringing the benzene, either before or after rectification, into contact with sodium (or potassium) hydroxide, by subjecting it to prolonged agitation with a solution of the reagent, fresh supplies of which are added at intervals—the exhausted hydroxide being first run off through the outlet valve at the bottom of the mixer. The time necessary for the reaction depends on the amount of carbon disulphide in the benzene; the action of the hydroxide being also more sluggish in the presence of only small amounts of carbon disulphide. The reaction is to be conducted at the

temperature most favourable for bringing about the reaction—a temperature just under the boiling point of the benzene treated. The treatment is conducted in a suitable mixing vessel provided with a heating coil and reflux condenser. The usual washing with sulphuric acid may either precede or follow this special treatment, or (as mentioned) the benzene can be treated after rectification, in which latter case the first portion only of the rectified product need be treated. The resultant solution of sodium thiocarbonate and sodium carbonate separates out beneath the benzene, and can be drawn off as usual.

The sodium hydroxide can, it is remarked, most cheaply be obtained by treating a solution of soda ash with lime. The resulting caustic liquor should have a strength of from 20° to 25° Twaddel.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for July 19.]

Nos. 9668—9974.

DAVIS, H. N.—"Liquid fuel burners." No. 9830.
GRIMWADE, W. R.—"Distillation of tar, &c." No. 9770.
HEINEMANN, A.—"Manufacture of trinitrobenzene." No. 9723.
IDIENS, G. & J.—"Igniting applicable also for operating gas-taps." No. 9788.
TAYLOR, W.—"Breeze washing and purifying plant." No. 9668.
TWIGG, W. R.—See Davis. No. 9830.
WEBSTER, H. R.—"Gas-testing apparatus." No. 9798.

Application for Restoration of Lapsed Patent.

Notice is given that CHARLES CLAUDE CARPENTER has made application for the restoration of the patent granted to him for "Improvements in Inverted Incandescent Gas-Burners," No. 5289 of 1909, dated March 4, 1909, and the patent of addition No. 25,874 of 1911 for "Improvements in Inverted Gas-Burners," and dated Nov. 20, 1911, which expired on March 4, 1916, owing to non-payment of the renewal fee.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:

Bill read a second time and committed: Local Government Provisional Orders (No. 7). This Bill was subsequently reported, without amendment, and will be considered by a Committee of the whole House to-day.

Bill read the third time, passed, and sent to the Commons: Conway and Colwyn Bay Joint Water Supply.

Bill read the third time, with amendments, passed, and returned to the Commons: Tynemouth Corporation.

The Hornsey Gas Bill was returned from the Commons, with amendments, which were considered and agreed to.

The following Bills have received the Royal Assent: Folkestone Gas, Hornsey Gas, Local Government (Ireland) Provisional Order (Gas), Plymouth Gas, South Metropolitan Gas, Uxbridge Gas, Wakefield Water.

Low Temperature Distillation Products.

Last Tuesday, Lord MONTAGU OF BEAULIEU asked what steps had been, or will be, taken to increase the production in this country of liquid fuel, including benzol from gas-works and low-temperature distillation plants, in view of the needs of our aerial, naval, and military forces, as well as for commercial purposes. He suggested that the Government should go into the question of the production of benzol to meet requirements. He had himself produced benzol with great success.

Lord STANMORE said that steps were being taken to increase the production of benzol in gas-works; and a Bill was before Parliament to enable the Board of Trade to substitute a standard of calorific value for a standard of illuminating power.

HOUSE OF COMMONS.

The following further progress has been made with Bills:

Bill as amended considered, amendments made, and to be read the third time: Aberdare and Aberaman Gas [Lords].

Bill reported with amendments: Yeadon Water [Lords].

Bill read the first time, and referred to the Examiners: Conway and Colwyn Bay Joint Water Supply.

Bill read the third time and passed, with amendments: Hornsey Gas.

The Gateshead Corporation have withdrawn their petition against the Newcastle-upon-Tyne and Gateshead Gas Bill. The Bill is now unopposed, and has been referred to the Committee on Unopposed Bills.

CALORIFIC POWER STANDARD BILL.

As mentioned in the "JOURNAL" last week, certain amendments were made in the Gas (Standard of Calorific Power) Bill by the House of Lords when the Bill was in Committee on the 13th inst. In order to keep our parliamentary record of the Bill intact, we give the following report of what transpired in connection with the amendments agreed to.

Viscount CHURCHILL moved to insert additional words in subsection (1), immediately before paragraph (*a*). He said that the amendment standing in his name was of a technical nature. It was the result of discussion between the experts; and he understood the Government were willing to accept it.

Amendment moved—

Clause 1, page 1, line 16, after "proper" insert "including such variation as they may think desirable of the prescribed pressure at which the gas is to be supplied."

Lord STANMORE, on behalf of the Government, accepted the amendment; and it was agreed to.

Lord STANMORE moved to omit the word "special" ["the special Act or Order"] at the end of subsection (1), remarking that this was merely a drafting amendment to make the wording in this line correspond to the wording in the first line of the clause.

This amendment was also agreed to.

The amendments were reported to the House on Tuesday last; and the following day the Bill was read the third time, with the amendments, passed, and returned to the Commons.

YEADON WATER BILL.

The consideration of this Bill by the House of Commons Committee presided over by Sir WILLIAM MIDDLEBROOK [*ante*, p. 121] was continued on Tuesday and completed on Wednesday of last week.

As was the case before the House of Lords Committee, the geological evidence on either side was extremely indefinite as to the possible effect of the Yeadon Water Company's well upon the springs from which the Wharfedale Council obtain their supply. While, on the one hand, the witnesses for the Company were reasonably positive that there would be no effect, those called for the District Council would not commit themselves more definitely than to say that there was quite a reasonable chance of interference; and, this being the case, the Council were entitled to protection, as the effect of any interference would only be noticeable some years after.

Mr. W. B. CLODE, K.C., in addressing the Committee on behalf of the Wharfedale Council, first of all argued that the well, which, as had already been mentioned, had been sunk, but not worked to any great extent, was illegal, and that at present he had the right of asking the Attorney-General to take action against the Company if he could prove that the well was affecting his springs. If the Committee, by passing the Bill, rendered the well legal, this right of action would be taken away from him for all time. He contended that it was not a reasonable burden to put upon him to prove before the Committee that the well would affect the springs—more especially having regard to the maze of geological evidence. With bodies of scientific men differing on the geological aspect, it was impossible for the Committee to come to any of definite conclusion on the point; but there was plenty of evidence to create quite a reasonable doubt as to what might happen. With regard to the arrangement between the promoters and the West Riding of York Asylums Board, he asked the Committee not to allow this prospective customer of the Wharfedale Council, in the Wharfedale area, to be supplied by the Yeadon Water Company, as would be the case under the arrangement if the Asylum could prove that the Company's well was depleting the Asylum well of its water.

The CHAIRMAN, in calling upon Mr. Freeman for the Asylums Board, said that at first sight it did not appeal to the Committee that one authority should have the right to supply in the area of another authority.

Mr. FREEMAN explained the circumstances under which this clause was brought about, and said that hitherto the Asylums Board had depended entirely upon their own well. The arrangement arrived at with the promoters was that they should supply the Asylum in the event of their well interfering with the Asylum well.

Mr. HONORATUS LLOYD, replying for the promoters, explained that, under their Act of 1899, the Yeadon Company had authority to supply water outside their district without limitation; this power having been granted to the Company nine years before the Wharfedale Council bought the undertaking of the Company who used to supply in this area. It was only in order to clear up any possibility of doubt as to the legality of the well from which the Company proposed to pump in future that the Committee were asked to confirm it. If, however, the Committee thought it was in the public interests to leave the position in such a way as Mr. Clode had put it—namely, that at any time the Wharfedale Council could move the Attorney-General on the ground that the well was illegal and for the parties to contest it probably to the House of Lords and both be ruined in the process—well and good. As to the effect of the well upon the Wharfedale Council's springs, all he could say was that millions of gallons had been pumped from it, and the Wharfedale Council neither knew of it nor had they experienced any interference.

The CHAIRMAN, in giving the Committee's decision on Wednesday morning, said the preamble of the Bill was proved—*i.e.*, the Company's well was allowed, as also was the clause agreed with the Asylums Board.

The clauses were then adjusted, and the Bill was ordered to be reported for third reading.

Bridport Gas Company, Limited.—A dividend of 7 per cent. is to be paid by the Bridport Gas Company for the year ended June 30. There were 2795 tons of coal carbonized, and 28,211,000 cubic feet of gas (2,000,000 cubic feet less than last year) sold. During the year a tar dehydration plant has been installed, and the contract for local road-spraying secured.

Gas Tragedy at Brighton.—Rose Smith, on returning to her home at Brighton last Thursday evening, found her mother lying on the floor with her head in the oven, and the gas turned full on. She promptly opened the window, turned the gas off, and pulled her mother out into the passage. Artificial respiration was tried by a police officer; but when the doctor arrived, he pronounced life extinct.

LEGAL INTELLIGENCE.

THE SOUTHAMPTON COMPENSATION APPEAL.

Judgment.

The Court of Appeal yesterday delivered its reserved judgment in the case of *Southampton Gas'ght and Coke Compyny v. Stride*, from the award of his Honour Judge Gye at the Southampton County Court in favour of the Company of 1d. per week [*ante*, p. 121].

The MASTER OF THE ROLLS said Stride was a blacksmith's striker who met with a serious accident in June, 1912, and the employers paid him half wages at the rate of 13s. a week till July 16, 1914. The man had been under treatment for some time for paralysis; but the treatment had not resulted in any improvement in his condition, and at the present time he was unable to walk, although his arms were not affected. The employers applied to reduce the amount of compensation; and on the application coming before Judge Gye, in January, 1915, expert evidence was adduced on both sides. Although it was admitted the man was unable to do his usual work, the Judge thought he ought to try to overcome what was called loss of will power, and he reduced the compensation from 13s. to 10s. a week. It was difficult to justify such an award. In October, 1915, the employers made a second application to the same effect. This was followed by an application on the part of the workman to increase the amount. The two applications were heard together; and in the result the Judge made an order for 1d. per week. From this decision the present appeal was brought. Expert evidence on behalf of the employers was given, to the effect that there were no objective symptoms to account for the incapacity, and that it was due to want of will power. No one said the man was a malingerer. The Judge thought the loss of will power was as much due to the accident as to any objective symptom, and he appeared to be influenced by the idea that light work would be beneficial to the man, and might effect a cure. But what right had the Judge to so hold? His Lordship declined to believe that the man was not an honest man, and there was not a particle of evidence that he could do the work suggested. It did not appear that the man had refused or neglected to follow the advice of the doctors. The loss of will power was the result of the accident. Consequently, the award could not stand; and, on the appeal of the workman, the amount of compensation would be increased to 13s. per week. The present decision would not prevent another application on the part of the employers if they could obtain evidence of refusal to perform light work.

Lords Justices PICKFORD and WARRINGTON concurred; and the Company were ordered to pay the costs of the appeal and in the Court below. A stay of execution was asked for; but the Court declined to grant it.

LIABILITY FOR DAMAGE CAUSED BY A GAS ESCAPE.

Action against the Manchester Corporation.

In the Crown Court at the Manchester Assizes, before Mr. JUSTICE LOW, Mr. Bernard Levy, a cotton piece goods merchant, of Rook Street, Manchester, was the plaintiff in an action against the Manchester Corporation to recover compensation for damage to goods from an escape of gas. The defence was that plaintiff had been guilty of contributory negligence.

Mr. WINGATE SAUL appeared for the plaintiff; and the Corporation were represented by Mr. EASTHAM.

The case for the plaintiff was that on April 16 he arrived at his warehouse and noticed a strong smell of gas. He at once turned the gas off at the meter and examined the fittings; and as he could discover nothing wrong with them, he turned the gas on again. Later in the morning it became necessary to go with a customer to see some goods in another room. He struck a match to light the gas, when there was an explosion, fire was caused, and the goods in the room were damaged. It was found that there was a defect in the street-main, and that gas had in this way percolated through the wall of the warehouse. It had been agreed between the parties that, in the event of the plaintiff succeeding in the action, the damages to be paid should be £100.

The plaintiff, in giving evidence, denied that he had stated that he searched with a light for the point where the gas escaped.

His LORDSHIP asked how contributory negligence could be an answer to a nuisance?

Mr. EASTHAM produced a charge note sent by the Corporation to gas consumers, and said there were instructions printed on the back in red ink telling people what to do where there was a smell of gas.

His LORDSHIP: How is he bound by anything on the back of that document?

Mr. EASTHAM: We supply him with gas as a customer, and he is under a duty to observe the conditions when we ask that special precautions shall be taken.

His LORDSHIP: What right have you to make regulations?

Mr. EASTHAM: The only regulations we are entitled to make are those which impose a duty upon customers to exercise certain care.

His LORDSHIP: Where do you get the authority from to do that?

Mr. EASTHAM: We will not supply unless customers do that.

His LORDSHIP: You say this is part of the contract?

Mr. EASTHAM said he need not put it as high as that. He was not suggesting that the Corporation were free from liability, but that they asked that certain precautions should be taken.

His LORDSHIP: Why? I do not know whether it was a contract or what it is. You may say all sorts of things; but it does not follow that because you say them other people have to pay attention to them. Because I choose to write something upon the back of a piece of paper it does not necessarily bind anybody else.

Mr. EASTHAM said he had pleaded negligence. If a man went looking for an escape of gas with a light, as his evidence would be in this case, he was guilty of negligence. He had also failed to take reasonable precautions.

His LORDSHIP said if the Corporation attached much importance to the notice printed in red ink on the document produced, they should take care that it should be better printed. On the copy he had it was almost illegible.

An inspector and several officials and workmen of the Gas Department were called. They stated that plaintiff told them he was looking for the escape with a light when the explosion occurred.

His LORDSHIP, without calling upon Mr. Saul, said the nuisance was admitted; but it was said, on behalf of the defendants, that although, *primâ facie*, they were liable for the consequences of the nuisance created by them, yet the conduct of the plaintiff was such that he was not entitled to recover damages for the nuisance. He accepted the statement of the plaintiff, and gave judgment for the amount agreed upon, with costs.

TAR OIL FOR DIESEL ENGINES.

As already briefly intimated in the "JOURNAL," there has been heard in the Patents Court an application by the Suffolk Electricity Supply Company, Limited, for a licence to use a German patent, so as to enable the Diesel engines on their Felixstowe plant to employ English tar oil instead of American oil fuel. The adoption of the invention, it was claimed, would ensure security of fuel supply, and at the same time reduce the fuel bill by one-half. The patent is in the name of Konrad Aust, of Berlin, and is an arrangement by which a preliminary ignition charge is injected through a separate duct to raise the temperature to vaporize the tar oil, the duct being cut off from the chamber during the ignition period. The invention secures immediate and certain ignition, and is in the nature of an auxiliary pump which injects oil of lower ignition temperature in advance of the main fuel oil.

It was stated by Mr. N. Prentice (the Secretary of the Company) that manufacturers he had approached asked £363 for making and fitting this special appliance to two engines. If the Board of Trade would give the Company a licence for the auxiliary pump, he was confident he could make and fit it to two engines for £60. For 112 tons of oil, which the Company used last year, at the present price the cost would be £960. By using tar oil for a similar amount of work, the cost would be brought down to £576, a saving of £384 for fuel. But if it cost £363 to fit the apparatus to two engines, it would hardly be worth while to makers of electricity, unless it were guaranteed that the war would last more than another year. The purchase of American oil was against this country's interest to-day; it was to the national interest to encourage the use of tar oils in Diesel engines.

The application was opposed by Messrs. Mirrlees, Bickerton, and Day, Limited, the sole licensees under the patent in this country before the war. They paid £1500 down for the licence, and agreed to pay a royalty of 2s. 6d. per horse power on all engines fitted; and they urged that they could meet the entire demand for the apparatus. Mr. Charles Day (the Managing-Director) said they had experimented to ascertain how many varieties of tar oil could be used with these engines, and had to set up an installation for distilling tar oil. In the beginning, they found great difficulty in getting the oil. They engaged a chemist, who had been chemist for a tar distillery, and had to use their distillery for the supply of tar oil to their customers. Including payment for the patent, their preliminary expenses came to £3000. In their price they added the 2s. 6d. royalty for the patentee and 2s. 6d. for themselves towards a sinking fund to recoup themselves for this preliminary outlay. The prices of fuel oil began to creep up a year after the outbreak of war. They had been from £3 to £4 a ton. In January last they were £8 to £9. Tar oil cost £3 or £3 10s.—it varied according to the district. This complicated and delicate piece of apparatus required considerable skill to instal. Personally, he should object to any stranger fitting it to an engine he had anything to do with. His firm were pioneers in this matter, yet they had not had an inquiry from the Company. To everyone who made this type of engine they had offered a licence to make this special apparatus, with the benefit of their experience as to details of manufacture and drawings. These auxiliary pumps had to be watched after fitting; and taking into account all the risks the manufacturer ran, the price was not excessive.

The Comptroller (Mr. Temple Franks) asked Mr. Day if he did not think that, as to terms, he had been in a sense "done" by the Germans. He had himself lately seen many agreements with German firms; and he had been astounded at some of the terms that English manufacturers had been ready to adopt. Mr. Day did not, however, consider his firm were placed in any unsatisfactory position.

The Comptroller will in due course report to the Board of Trade on the application.

Conspiracy and Protection of Property Act.

At the Felixstowe Petty Sessions on Monday of last week, George Hill, a gas stoker, was summoned for breaking a contract of service with the Felixstowe Gas Company on July 1, in respect of which the Company claimed £2 1s. 3d. It was explained that the proceedings were taken under the Conspiracy and Protection of Property Act. On the date named, Hill should have gone on duty at 6 o'clock in the evening for the night shift; but he did not turn up until twenty minutes later, and then, it was alleged, he was considerably under the influence of drink. He went away, but returned later in a much worse condition, and could not carry out his work. After attempting to fight his mate, he cleared off the works altogether. The Company wanted it to be known that the men must stick to their work in a proper manner. On the following Monday, Hill did not return to work; and a day or two later he left Felixstowe with his family, without giving notice or seeing anybody. Defendant, who pleaded guilty, said he was overcome by illness—not beer. The Chairman of the Bench (Mr. F. W. Mason) remarked that it was a very serious case. Defendant was liable to a fine of £20 or three months' imprisonment; but they would only inflict a penalty of £1, including costs. The summons in respect of money in lieu of notice was withdrawn, on defendant paying 2s. 6d. expenses.

MISCELLANEOUS NEWS.

EUROPEAN GAS COMPANY, LIMITED.

The Ordinary General Meeting of the Company was held last Tuesday, at the London Offices, Finsbury House, Blomfield Street, E.C.—Mr. H. E. JONES in the chair.

The SECRETARY (Mr. W. B. Brady) read the notice convening the meeting; and the Directors' report was taken as read.

The report was as follows:

The adverse conditions referred to in the last annual report have prevailed to an even more marked extent during the year under review, which covers twelve months of war, as compared with eight months in the previous returns.

The greatest difficulty has been experienced in obtaining shipping; and at times the most exorbitant rates had to be paid in order to maintain the supply of coals at the Company's various stations.

The condition of the manufacturing and distributing plant has been maintained, although it has not been possible, owing to the shortage of labour and material, to undertake more repairs than were absolutely necessary. Moreover, the cost of all material has been much enhanced.

Under these circumstances, the shareholders will not be surprised to learn that the profits of the Company have been very materially affected, and that the Directors consider it advisable to recommend a reduction in the final dividend.

They propose taking a substantial sum from the reserve of undivided profits, and that a dividend of 5s. per share (instead of the usual 10s.) be paid on the 1st of August next, making, with the interim dividend paid on Feb. 1 last, 15s. per share, free of income-tax.

The sale of gas shows in the aggregate an increase of 10 per cent. over the consumption for the previous year; the decrease reported at the last meeting having been more than recouped.

The shareholders will be glad to know that the Directors in most cases supplement the allowances made by the French Government to the wives and families of men in the Company's employ serving at the front. They also granted facilities to their staff abroad to enable them to subscribe to the last French loan.

The average length of the Company's concessions is now 25½ years.

Owing to war conditions, the Stock Exchange value of the investments held by the Company stood, on March 31 last, at £71,762 below the amount at which they appear on the balance-sheet now before the shareholders. The difference is covered to the extent of £12,219 by the reserve for depreciation of investments.

The Directors who retire by rotation are H. C. Smith, Esq., and C. C. Carpenter, Esq., D.Sc., and the retiring Auditors are J. Reeson, Esq., and H. J. Luff, Esq., who, being eligible for re-election, offer themselves accordingly.

BUYING COAL AND SHIPS.

The CHAIRMAN said it was his duty to move the adoption of the report and accounts. They were still meeting under the shadow and depression of the great war; and they could only share the general appreciation of the fact that this country and her Allies did appear at last to be moving the invader back over the territory which he so outrageously and infamously violated, and so put his adversaries to the detriment of jumping at them by surprise. The immediate business of the meeting was to explain that (he thought to the shareholders' considerable surprise) the Directors were able to offer them that day a dividend of 7½ per cent., free of income-tax. He said "surprise" because it was a matter of common knowledge that the excessive cost of coal and freight had rendered it impossible for most of the British companies trading abroad to declare any dividend at all. The only exceptions of which he knew were the companies working in India, who were fortunately able to get local coal, and so were relieved of the difficulty of shipping coal. The report informed the shareholders that there had been great difficulty in obtaining shipping; and the most exorbitant rates had had to be paid for the carriage of the coal, which again had to be contracted for at enormously enhanced prices. The shareholders knew that the statutory regulation of coal prices, which was favourable to English companies, of 4s. per ton on pre-war rates did not extend to foreign operating companies; and so they had to pay in recent purchases, before the coal was shipped, prices for it not far from double what it was formerly. But there was really no help for this. The difficulty of the shipping had been explained at length over and over again. But during the year, the question arose as to whether they would get the coals carried to France for which they had contracted. In consequence, the Board, like most of the leading gas companies, had been trying to acquire ships for the Company's own use. This was a bad time to go buying anything—least of all ships, which everybody wanted. They had, however, acquired certain ships, most of them since the date of the balance-sheet; but there was one ship acquired, the expenditure for which was in this sheet. They had also made time-charters, which enabled them to do better than others who were less favourably situated. The whole position had been one of difficulty; and the language of the report was not in the least exaggerated.

DIVIDEND FREE OF INCOME-TAX.

Considering these circumstances, he thought the shareholders, as he had said, would be surprised to find they were to receive 7½ per cent., against the 10 per cent. formerly paid. If they would make calculations for themselves, as to the difference between the previous and the present income-tax, which was paid in addition to the dividend, they would see they did not get at all a bad dividend; and this through the convenience of having the income-tax paid for them. He thought that no reasonable person could do other than feel that the Company were surprisingly fortunate in being able to declare such a dividend in these times, and under the conditions of their working.

MAINTAINING THE WORKS, BUT SAVING ON IMPROVEMENTS.

The circumstances were a little special in another way. He was no sure the shareholders could have had quite the dividend that was being paid but for the fact that, owing to the war, the extra cost of obtaining materials, the difficulty of getting any labour, and the cost of such labour as they did get, had made it necessary to avoid spending money on the works, save that which was necessary to maintain them in a working condition. The shareholders might perhaps understand that ordinarily the Directors seized opportunities of replacing old plant with plant on the very best lines—not merely with the same form of plant that previously existed, but with the most modern plant, which constituted an improvement. If this work had been carried out this year, it would have invaded some of the profit they were now distributing. This course was not being taken with any damage to the actual condition of the works. His colleagues and himself would be the last to stand there recommending the shareholders to declare profit if they thought it was only being earned by any failure to maintain the works. There had, however, not been an item of maintenance which would this year have justified an improvement in the plant. Therefore, he warned the shareholders that, in succeeding years, the payments necessary to keep up the plant, to improve and develop it in the way they had been doing for many years past, would have to go on again, and might to some extent cause larger expenditure under maintenance. But this expenditure need not frighten them, because, when they got rid of war conditions, the Company would resume their old march of progress and prosperity.

AN EMBARRASSING INCREASE IN CONSUMPTION.

In the midst of the difficulty of getting coal, they were met with the fact that in France, as in England, coal for household use being dear and scarce, the consumers had been flying to the use of gas to rather an unusual extent for the purpose of heating, with the result that they had in the sales an increase of 10 per cent. upon the previous year. But it was not so great as 10 per cent. if they compared it with the year before—a normal year. It was, however, an embarrassing increase, owing to the difficulty of getting raw material, and to the fact that the cost of making gas in some places now approached the price at which they sold it.

THE PRICE OF GAS AND FRENCH EQUITY.

But it was a gratification to him to be able to tell the shareholders that three important towns had already agreed to pay an extra price for gas as long as war conditions continued. In the case of others, the Company entered proceedings; while in another town the judgment of the Conseil de Préfecture was that the Company should be allowed to increase their price temporarily, while experts were determining what should be paid to them owing to the higher price of coals modified by the higher prices of coke and other residuals. The attitude of the French nation to the Company was one of equity, fairness, and justice. It would be most gratifying to the shareholders if they saw how regularly the money was transmitted from France to their office—how uniformly it came in. It would also be surprising to them to learn how little were the bad debts they were making—not at all out of the usual run. These two facts, in his estimation, spoke volumes for the sense of justice with which the consumers were treating the Company throughout this dreadful emergency. When he stated that a French authority told him the other day that the price of coal for domestic use in Paris was £5 a ton, they could imagine how severe were the conditions of life in France; and what a sacrifice it must be to the people to part with their money so freely in order to pay their just debts to the Company. In this country, the people, in comparison, felt practically nothing of the war. Their coals and other necessaries were, it was true, a little dearer; but they were living in such comparative comfort that the war did not come home to them in all its severity. Just fancy what it must be to those living even in Paris, where war was only a few miles away, and must always be present in the minds of the people.

AIDING THE WIVES OF THE MEN AT THE FRONT.

The shareholders would be glad to have general particulars as to what the Company were doing with reference to the allowances they were making outside what the French Government were paying to the wives of the Company's employees at the Front. He was happy to tell them that the expenditure for this purpose amounted to about £12,000 in the year, which was £3000 in excess of what it was the year before, which showed that the amount was growing.

A GENERAL SURVEY.

Generally as to the undertaking, the shareholders would be surprised to learn that the Company sold gas in their towns in France at a price quite comparable with that charged in England. The average price was 4s. 2d. for the whole of the towns under supply, which was not an unusual figure in England, where coals were much cheaper. The working was good. The gas made per ton of coal carbonized, the gas sold per ton, and the leakage would bear comparison with the results of companies of similar size on this side. The figures showed that their officers and their staffs were doing their work excellently and well, though very short-handed. Nearly every man of military age had been called to the war; but still their works were carrying on with old men and supplementary assistance of every kind, under very great difficulties. In view of these conditions, it was especially creditable to their officers and staffs, as well as to the proper sense of justice of the people in enabling their money to be sent over regularly, that the profits had been earned, and that the interests of the shareholders had been so well looked after. This was a great gratification to them all; and it was, therefore, with much pleasure that he moved the adoption of the report and the accounts.

The DEPUTY-CHAIRMAN (Mr. R. S. Gardiner) seconded the motion.

The CHAIRMAN remarked that it would be seen from the accounts that the amount owing to the bankers was large. This was simply because the stocks of coal and other things were dearer; and they had also had to pay deposit money on the purchase of ships.

The motion was unanimously carried.

THE DIVIDEND.

Moved by the CHAIRMAN, and seconded by the DEPUTY-CHAIRMAN, the interim dividend of 10s. per share, less 6d. per share for French stamp and transfer duty in respect of all shares held in France, was confirmed, and the declaration of a final dividend of 5s. per share, free

of income-tax, was also agreed to, less the deduction of 6d. per share on all shares held in France.

RE-ELECTIONS OF DIRECTORS AND AUDITORS.

Proposed by the CHAIRMAN, and seconded by the DEPUTY-CHAIRMAN, the retiring Directors (Mr. H. C. Smith and Mr. C. Carpenter, D.Sc., were re-elected; as were also the Auditors (Mr. Joseph Reeson and Mr. H. J. Luff), on the motion of Mr. J. HATCHWELL, seconded by Mr. BERNARD F. HARRIS.

WELL-DESERVED THANKS.

The CHAIRMAN said he must ask the shareholders to remember the services of those who had been so successful in bringing the Company to the present prosperous issue under very unfavourable and difficult circumstances. Speaking of the staff in London, they all knew their colleague, Mr. W. Williams, who was not only the Managing-Director, but was the technical head of the staff both here and abroad. No one could tell what time and devotion he gave to the service of the Company. He had upon him the anxieties of all the difficulties—the purchasing of coal, then getting ships to carry the coals, then obtaining permission for the ships to leave the ports, then getting them unloaded at the port of delivery, and then getting them back again. They, as shareholders, could hardly conceive what all this meant. He, as Chairman, got some reflection of it; for he received frequent communications from Mr. Williams showing how he was surmounting the difficulties and toiling along in the interests of the Company. The extraordinary prosperity of the Company in a year of great adversity could only be traced to the unremitting diligence and unfailing care and foresight of the Managing-Director, ably seconded by a most efficient and trustworthy staff. There was none better. In France, they also had men to whom they owed the greatest thanks, because they were working under the supreme anguish of men whose country had been violated by the invader, and whose circumstances were rendered most painful and strenuous in every way—with more than half of their staffs and men away at the war, and feelings harrowed by the loss of many friends and neighbours. Amid it all, they were carrying on the Company's concerns admirably. It was due to their duties having been so well and faithfully performed that the Directors had this first-rate statement to present to the shareholders. From the bottom of his heart came the sincerest expression of thanks to them—to masters and workmen alike. Mr. Gardiner had lately been in France, and had been in touch with their Manager (M. Gautier) in Havre. He would therefore ask him to second the motion.

The DEPUTY-CHAIRMAN, in seconding, said that the Chairman had referred so feelingly and so ably to their great indebtedness to their staff both here and abroad that he would have liked his words on the subject to be the last. As, however, he (Mr. Gardiner) had during the war visited most of the Company's stations, he should like to take this opportunity of assuring the shareholders that their interests were not only in the very best of hands here, but also abroad. Those of their Managers who were able to fulfil their duties (some were away on military service, and their duties were being carried on temporarily by others in their absence) and their staffs were all displaying the utmost devotion to the interests of the Company; and the way they made light of the many and great and increasing difficulties which they had to face in carrying on the business was worthy of all praise. They certainly deserved that, on this occasion especially, the resolution thanking them should be carried absolutely unanimously, and with the utmost cordiality.

The motion was heartily agreed to.

Mr. WILLIAMS (the Managing-Director) asked the shareholders to accept the best thanks of the officers and staffs at home and abroad for this vote. He would take care that the terms in which it had been passed were conveyed to the staff abroad, so that they might know how much the shareholders appreciated their conduct. The shortage of coal, of boats, and of labour, and the abnormal conditions generally, certainly had made it very difficult to carry on the business. But they had been able to carry it on, and had no doubt they would be able to still do so. As an example of what was happening at the present time in London, he might say that very shortly the Chief Accountant, the Secretary, and himself would be the only members left of the original staff of the Company. The others had all joined, or would soon join, the Colours. While he had no doubt they would be able to continue to carry-on, he might also express the hope that next year they would meet under more favourable circumstances.

Moved by Mr. J. HATCHWELL, and seconded by Mr. J. SOLOMON, a cordial vote of thanks was passed to the Chairman and Directors.

The CHAIRMAN, having responded, on behalf of himself and colleagues, said he might mention that, owing to the war conditions, the depreciation of the Company's investments had increased from £46,000 last year to £71,000 this—a difference of £25,000; and the securities that had fallen most were the best gilt-edged ones. Against the depreciation, there was a sum of £12,000 which existed last year; but they had not made any addition to it this year. They would, however, have to lose some of the depreciation on former market prices, inasmuch as they had to pay for the ships they had bought, or lose a much larger sum through the high rates of freight.

The Directors of the Weardale and Consett Water Company have decided to pay an interim dividend on the ordinary stock at the rate of 6 per cent. per annum. This is the same as for the corresponding period last year.

Dr. J. P. Longstaff, Lecturer on Chemistry in Edinburgh University, has been appointed Secretary of the Society of Chemical Industry. There were 98 applicants for the appointment. Dr. Longstaff, who is a native of Edinburgh, was educated at the Royal High School and Edinburgh University, where he took his B.Sc. and D.Sc. degrees. He has acted as Honorary Secretary of the Edinburgh and East of Scotland Section of the Society since it was formed last year.

"Burn-All"

?

THE DAVIS GAS STOVE CO. LTD.

THE GAS EXHIBITION SALONS,
60, OXFORD STREET, LONDON, W.

WELSBACH LIGHT COMPANY.

Increased Trading Profit.—A Dividend Declared.

The Fifth Annual General Meeting of the Company was held last Wednesday, at Winchester House, Old Broad Street, E.C.—Mr. CHARLES LOCK in the chair.

The SECRETARY (Mr. E. J. Butcher) read the notice convening the meeting; and the Directors' report and the statement of accounts were taken as read.

The CHAIRMAN, on rising, said that unfortunately Mr. J. R. Yates, the Chairman of the Company, owing to the very strenuous work which had devolved upon him, had suffered a breakdown in health, and, acting under medical advice, he was not engaged in business at the present time. He was, however, much better, and hoped soon to return to work. In submitting the report and accounts for the year ended March 31 last, he (the Chairman) might say that the Company had during this period experienced unprecedented difficulties in trading, as well in regard to obtaining the raw materials and labour requisite for the Company's business as in conducting affairs with a much depleted staff. No less than 73 of the male employees had already enlisted, and 24 others were waiting to be called up. This total of 97 might not appear a large figure; but in their business of mantle manufacturers they employed mostly female labour, and the number named represented practically all the male employees of military age who were eligible for service. The Board had encouraged enlistment, and had dealt in a liberal spirit with the question of assistance to dependants. Each case had been considered on its merits; and a sum of £2000 had been allocated to this purpose by the Board—a course which he felt sure would meet with the approval of the meeting. Up to the present, all trading difficulties had been overcome, in some measure due to the strong cash position occupied by the Company, and partly in consequence of the policy of the Executive. Notwithstanding the troublous conditions encountered in the twelve months, it would be noticed that the profits of the trading had continued to be on the up-grade. During the past financial year, a trading profit of no less than £26,427 had been made, which was £6300 over and above the 1915 figure. If the trading results since the reconstruction were reviewed, a steady improvement would be observed. In 1912, there was a trading loss of £4345, which in 1913 was turned into a profit of £5694. The trading profit in 1914 was £13,461; in 1915, £20,134; and for the past year, £26,427. These figures spoke for themselves. As to the items on the credit side of the profit and loss account, it should be remarked that the dividend of £14,673 from the shareholding in B. Cars, Limited, was practically double the corresponding figure in 1915, which was £7040. In three years the dividends received from that Company had aggregated no less than £25,241, on an investment which figured in the balance-sheet at £31,500. He thought this was a most remarkable record.

THE AUSTRIAN INVESTMENT.

While it was obvious that such a marked improvement as this would at all times be welcome, it was particularly so at the present moment, owing to the fact that the Company had during the year received no dividend whatever on their very large Austrian investment of £179,000. On the other side of the account, the Directors had deemed it prudent to write-down plant, machinery, &c., somewhat liberally, in order to allow for the fact that the plant and machinery required for the manufacture of munitions was necessarily bought when the cost was abnormally high. A depreciation of £2607 on investments, was unfortunately a familiar item in these days. The Company's investments had, indeed, been written-down to the official minimum price or the market price on March 31; and it was hoped that at some future date these values might again show some appreciation. Of course, the balance of profit of £18,949—which was the largest credit balance that had been shown in the Company's accounts up to date—was subject to liability for excess profits duty. Having regard to the very difficult times in which they had had to work, the Board considered this profit highly satisfactory. It had been the result of great energy and foresight on the part of the Executive; and they might perhaps claim some credit in having, in these most difficult times, somewhat increased the sales over those of the previous year. What the present year might bring forth, it was too early to forecast; but they were meeting current difficulties with all the energy they could summon. Passing to the balance-sheet, on the credit side it would be noticed that the figure of goodwill had been reduced to the low amount of £7304. No intimation had been received this year as to whether or not any dividend had been declared on the Austrian investment. The leasehold factory at Wandsworth had been written-down by £500; and expenditure on a new boiler-house had also had to be incurred.

THE MUNITIONS DEPARTMENT.

The increase in plant, machinery, &c., represented the additional plant and machinery required in the munitions department. When the call for munitions was made in May and June, 1915, the Board decided to take up the manufacture. The Company had already executed large orders for various articles; and at the present time they held a number of important contracts from the Ministry of Munitions. This work would not result in any but the most moderate profit—not having been undertaken with this object; but the Directors felt the shareholders would be glad to know that the Company were assisting the national cause in this direction. [Applause.] Indeed, at the present moment some 140 men and women were employed by them in this important work. Stock was some £9000 up, which, just now, was a most favourable feature. The item of £5000 for war loan, referred to by the Chairman a year ago, had enabled them to convert the old War Loan Stock into the new 4½ per cent. War Stock. This acquisition largely explained the reduction in cash on deposit and current account, as it appeared last year. On the other side, the debenture stock outstanding had been reduced to £212,000, which was in exact

The Main Advance.

THE introduction of the ***New*** Main Cooker marks a great advance in cooker construction. A salient feature is the treble-crowned oven packed with non-conductor which reduces loss of heat to a minimum. There are many other features which will interest you. Send for particulars or, better still, a sample, which will convince you.

R. & A. MAIN, LIMITED.

WORKS: Gothic Works, EDMONTON, N.; Gothic Ironworks, FALKIRK; and Gothic Works, BIRMINGHAM.
SHOW-ROOMS AND BRANCHES: 25, Princes Street, Oxford Circus, W.; 136, Renfield Street, GLASGOW; 83, Old Market Street, BRISTOL; 18, Severn Street, Deansgate, MANCHESTER; 97, Millfield, BELFAST; 333, Queen Street, MELBOURNE; and 12, Cunningham Lane, Pitt Street, SYDNEY, N.S.W.

accordance with the requirements of the trust deed. The balance of profit and loss account was increased by the credit balance of £5708 brought forward, and now aggregated £24,658—subject, as he had said, to the claim for excess profit duty, in respect of which the Company had lodged an appeal to the Special Commissioners. This question being therefore *sub judice*, he could not say more about it than that it was a factor which necessarily required the Board to take a somewhat conservative view of the matter of dividend. For some years the shareholders had been without a dividend; and the Board would have been only too glad to deal with the question in a more liberal spirit. But they had to consider this outstanding claim; and until it was decided, they were not in a position to know what cash they would have at disposal. They had, however, decided that they could fairly and safely, as a commencement, recommend a dividend of 2½ per cent. for the year. It was a matter of great regret to the Board that on this occasion, when they were declaring a dividend for the first time, their esteemed Chairman, Mr. Yates, was not present to have the pleasure of making the announcement. He concluded by moving the adoption of the report and accounts, and the payment of a dividend of 2½ per cent., less income-tax.

Lieut.-Colonel C. M. Crompton-Roberts seconded the motion.

Excess Profits Tax and Munitions Manufacture.

Mr. F. Walker remarked that it must be most gratifying to the Board to be able to propose a dividend, and cordial congratulations would be extended to them on placing before the shareholders so fairly satisfactory a report for the year of unexampled trouble, anxiety, and difficulty. As to the question of the excess profits duty, he must say he did think that, with regard to a Company of this kind—who had the patriotism to lay-down fresh plant (which after the war was over would perhaps need to be scrapped) for the benefit of the Empire, and for the purpose of relieving a Government who had not the commonsense to make this provision for themselves—it was a scandalous state of things that they should be told that whatever excess profits might be obtained in a year of this sort were to be subjected to some drastic confiscation. All he could say was that the Company were not alone in their troubles. He had himself called attention to even more scandalous cases than this. It was discouraging the industry of the country; and it ought to be put a stop to.

Mr. Holland said they had heard that the Company had very patriotically taken up the manufacture of munitions. It would possibly be a matter of interest to shareholders to know how much of the greatly increased profit was due to this work. It might enable them to form a better idea as to whether these increased profits were likely to be continued, even after peace was signed.

Mr. France inquired what was the nature of the guarantee on the debenture stock.

The Chairman, in reply, said there was a good deal of force in what Mr. Walker had said with reference to the excess profits duty. All these points were ever-present in the minds of the Directors; and so far as could be done, they would be utilized before the Special Commissioners. He had no doubt they would receive fair treatment. Regarding the profits on the manufacture of munitions, seeing that they were engaged until the middle of August laying-down plant, and only commenced operations after that, practically no profits shown in these accounts were due to the munitions department; while as to the accounts of the current year, the munition profits would, as he had already indicated, be of a very moderate character—this not having been the object with which the work was undertaken. The guarantee on the debenture stock was given by the German Company whose name had been so familiar to them for years, and was a guarantee for principal and interest.

Mr. France asked whether it was now of any value.

The Chairman answered that the Company in question was a very strong one; but in these times he did not think they need discuss the value of contracts with foreigners. They could be quite content to rely for the security of the debenture stock upon the assets in this country.

The resolution for the adoption of the report and accounts was then carried unanimously.

Director and Auditors Re-elected.

On the proposition of the Chairman, seconded by Mr. B. Cars, Mr. Yates was re-elected to his seat at the Board, the Chairman remarking that his colleagues regarded him as an ideal Director.

The Auditors (Messrs. Deloitte, Plender, Griffiths, and Co.) were also reappointed.

The Directors' Remuneration.

The Chairman then proposed a resolution to increase the amount provided for Directors' remuneration from £1050 per annum to £1400. He explained that an additional Director (himself) having been appointed, owing to two of the Directors being on military duty, made an increase to £1150 necessary; and the Board thought it better to take power to make the amount £1400, in case it might at any time be desirable to appoint yet another Director. There was, however, at present no intention to do this.

Major G. O. S. Pringle seconded the proposition, which, after some discussion, was carried with one dissentient.

Only British Subjects on the Board.

At an extraordinary meeting which followed the general meeting, a resolution was carried, after some discussion, altering the Articles of Association so as to ensure the Directors of the Company being British subjects.

Increase in Price at Dorchester.—The Dorchester Gas and Coke Company, Limited, announce that, owing to the continued increased cost of coals and materials, they are reluctantly compelled to further advance the price of gas as from the 1st inst. 2d. per 1000 cubic feet.

THE BEST BY THE BEST TEST—THE TEST OF TIME.

"EUREKA"

Highest-Grade High-Grade

GAS COOKER.

FOR 50 YEARS

it has led the way in steady, continuous perfecting, and it still leads to-day in design, simplicity, efficiency, reliability, and interchangeability.

JOHN WRIGHT & CO.,
Eureka Works,
BIRMINGHAM.

WIDNES AND THE SUPPLY OF TOLUOL.

Breaking Down the Opposition.

[From the "Widnes Weekly News," July 21.]

Developments have quickly followed the Widnes Town Council's vote against the further extraction of toluol for explosive purposes from the town's gas. As might have been expected, if the letter from the Ministry of Munitions read at last week's Town Council * was what it pretended to be, the chiefs of the department have moved with decision and purpose. On Wednesday morning, Mr. F. L. Halford, of the Ministry, met the representatives of the Gas Committee, and of those who were primarily the opposition, at the North-Western Hotel, Liverpool. As can be imagined, some very direct and penetrating truths were unleashed; and before these all the arguments which last week's hostility put forth lost their small force. The practical upshot of the conference was that the next day notices were issued calling a special meeting of the Town Council for Wednesday next. And the definite purpose of that meeting will be to submit resolutions rescinding the amendment which rejected the toluol scheme last week, and authorizing the Gas Engineer to proceed at once with the installation of the plant.

Opponents of the scheme seemed to have imagined that in this matter they were dealing with the leisurely and letter-loving officialism of the Local Government Board or the Board of Education. Instead, they find that the Ministry is indeed "aroused and resolute," who, as the gas world itself well knows, will not hesitate to apply compulsion speedy and absolute. A department which, next to the army, is doing most to win the war, was not likely to brook the shortsighted hindrance of any local authority.

* See "Journal," *ante*, p. 122.

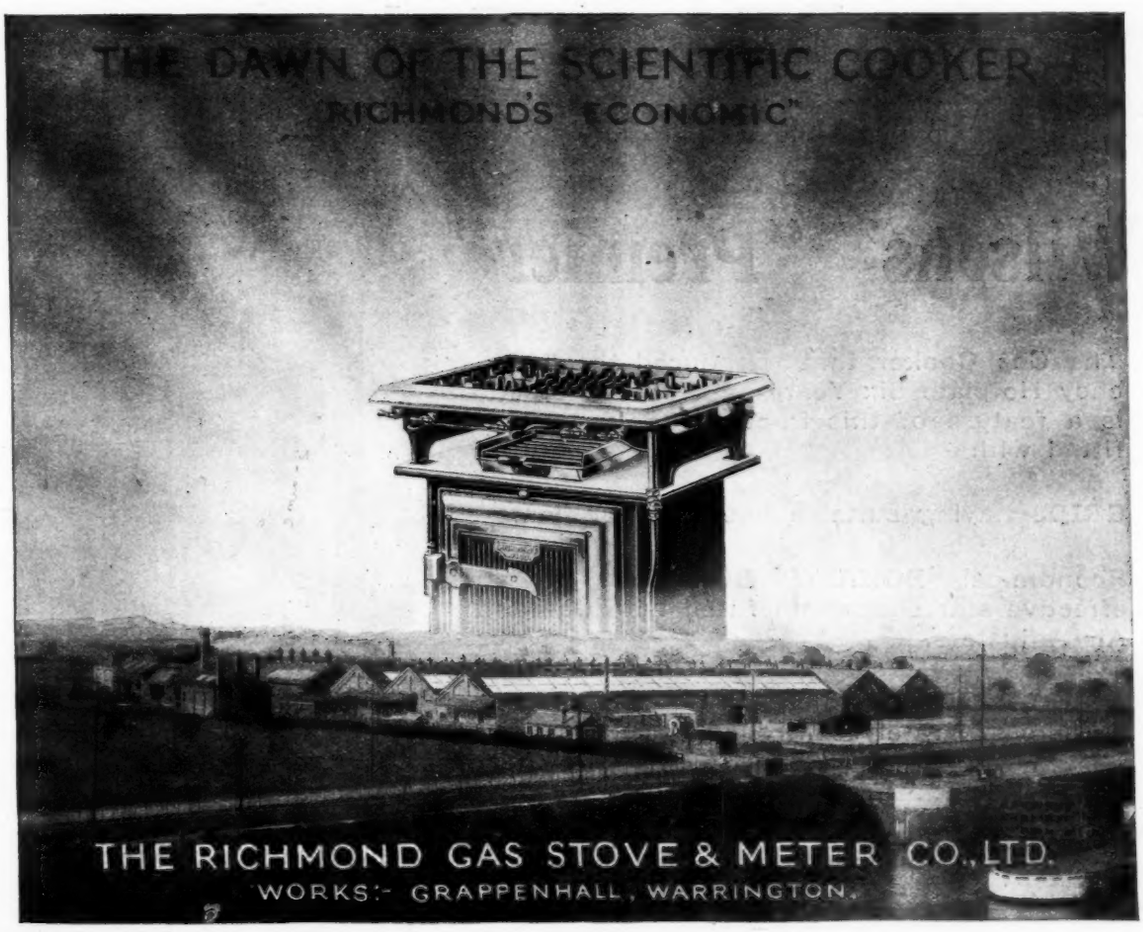
BLACKBURN GAS-WORKS EXTENSION.

The Engineer's Report on the Greenbank Scheme.

In a report last year on the state of the undertaking, Mr. A. Morton Fyffe, the Engineer and General Manager of the Blackburn Corporation Gas Department, advised that, before matters were put on a proper basis, it would be necessary to transfer all the gas making to the Greenbank works, and that the Addison Street works should then be used as a gasholder station only. He also pointed out that the carbonizing plant at the Greenbank works was practically worn out, and could never again be made satisfactory; and he advised that a large installation of vertical retorts should be proceeded with on the Greenbank works site at the earliest opportunity. On the recommendation of the Gas Committee, the Council in August last adopted these proposals; and since then all experience has gone to show that the scheme then suggested is the only means by which the department can be put in a satisfactory condition. At the time it was thought that it would not be possible to obtain the installation of vertical retorts until the termination of the war; but events have now transpired which afford an opportunity of proceeding with the work on the Greenbank site. In a report just made to the Gas Committee on the extension of these works, Mr. Morton Fyffe says he has no hesitation in advising them to proceed with the work at the earliest possible date, in order that at least part of the installation may be put into operation by the beginning of the winter of 1917. He advises the erection of a plant capable of producing 3,000,000 cubic feet of gas per day, which would supply requirements for eight or nine months of the year. For the remaining three or four months the balance required could be made up by carburetted water gas, or preferably by the operation of a few beds of the present inclined retorts at Greenbank.

Mr. Morton Fyffe says he understands that some considerable time ago the Committee decided that any future extension to the carbonizing plant should be on the vertical system; and he has no hesitation in advising them that the continuous carbonization of coal in vertical retorts is by far the most efficient and the most satisfactory method of manufacturing gas which can be obtained to-day. He then proceeds to briefly explain the different systems which are in vogue at the present time, and the reasons why continuous vertical retorts are given the first place. The many advantages he enumerates are, he points out, "not merely claimed from continuous vertical retorts on theoretical grounds, but they have been amply justified and confirmed by experience." This he is able to corroborate in its entirety from personal experience of the construction and operation of the same system [Glover-West] at the Nelson Gas-Works.

It is obvious, the report proceeds, that any vertical retorts erected at Greenbank must be on a piled ferro-concrete foundation; and the fact that unless the piled foundation is completed during the coming autumn it will be impossible to have any part of the installation at work before October or November of 1917, makes the matter of the utmost urgency. There is a great deal of work to be done before the first pile is driven; and negotiations will require to be conducted with the Local Government Board and with the Ministry of Munitions before operations can be commenced. It is therefore necessary that the sanction of the Council for proceeding with the scheme should be obtained at the earliest possible moment. This large installation of new carbonizing plant involves the consideration of the capacity of the other part of the works and plant, so that they may be of a size capable of dealing with the increased quantity of gas. At the present time the condensers, the tar and ammonia extractors, and the purifiers are not large enough for the existing carbonizing plant; and during past years it has been quite impossible to either entirely free the gas from sulphur or to completely extract the ammonia. The Department has now on order water-tube condensers, which it is intended shall be paid for out of revenue. A new washer-scrubber is also being constructed and will be paid for out of revenue; and it is hoped


THE DAWN OF THE SCIENTIFIC COOKER
RICHMOND'S "ECONOMIC"
THE RICHMOND GAS STOVE & METER CO., LTD.
WORKS:- GRAPPENHALL, WARRINGTON.

by this means to be able to increase the yield of sulphate of ammonia, as well as to prevent ammonia going forward to the consumers' meters—"an occurrence which has been more a rule than an exception, and which has already cost the Corporation thousands of pounds." A new exhauster will be of the latest "Turbo" type. It will be necessary to provide two new purifiers, making eight in all, so that the purification plant will be able to deal with all the gas made on the works; and an additional station-meter must be put down. Finally, instead of providing additional storage accommodation, a "boosting" plant will be installed to transmit the gas from Greenbank to Addison Street.

Mr. Morton Fyffe estimates the cost of the work at £80,000; but he adds that the savings to be effected by the operation of the re-modelled works will more than pay the interest and sinking fund charges on the capital sum spent. From a study of the figures of the annual consumption of gas (which has not materially increased during the last ten years), and the figures of profit and loss, he says, it is evident that, unless drastic and revolutionary measures are taken, the department will continue to deteriorate. First of all sufficient and efficient plant must be constructed, and thereafter the sale of gas must be energetically pushed, and new business sought. During the past ten years the sale of gas in Blackburn has increased by only 8·82 per cent.; whereas many undertakings supplying areas where the population has not grown have during the same period added 50 per cent. to their annual consumption.

In the last portion of his report, Mr. Morton Fyffe urges that it will be to the financial advantage of the Gas Department to distil their tar and sell the products, instead of continuing as at present to dispose of the crude tar. The apparatus to be installed would be so designed that if at a later date it was thought desirable to carry the distillation to a further stage, and produce some of the finer coal-tar derivatives, the plant put down could be extended to any degree thought advantageous. The estimated cost of the plant proposed would not exceed £5000. Debenzolizing plant now on order will be arranged so that it can be used at will for dehydrating the tar.

SULPHATE OF AMMONIA IN GERMANY.

[From the "Manchester Guardian."]

One of the most remarkable of Continental periodicals which has continued publication during the war is "Die Friedenswarte." Dr. Fried, the Editor, has continued to publish this journal from Switzerland; and as it contains articles written by many leading German and Austrian pacifists, it is particularly interesting to read at the present time, as giving the point of view of men whose opinions do not find expression in most German newspapers. Writing in the June number of the paper, Dr. Fried said:

It is stated that the Badische Aniline and Soda Manufacturing Company are about to establish new works at Morseburg for the production of sulphate of ammonia. The managers of the undertaking explain that the object of this enterprise is to make Germany independent of foreign countries for its supplies of artificial manures, and to make the agriculture of Germany capable of providing food for double the number of its inhabitants.

This cuts the ground from under the feet of the Imperialists, the Pan-Germans, and the Big Navyites. Have they not been fooling their adherents with the tale that German soil was unable to nourish the present population? We have always opposed such statements. Some years ago Franz Openheimer showed that, by dividing up the large estates, and by a scientific treatment of the soil, provision could be made for a growing population for the next hundred years. And now a chemical company comes along and solves the problem with sulphate of ammonia—that is to say, by science, and not by bayonets.

COAL-GAS FUEL FOR MOTOR VEHICLES.

[From the "Commercial Motor," July 20.]

It was our pleasure, more than seven years ago [April 29, 1909], to examine at considerable length the possibilities of the use on the road of compressed coal-gas as a fuel for motor vehicles. We then recorded particulars of some interesting experiments with a four-cylinder 24-30 H.P. Duerkopp engine, together with illustrations. We were able to examine the essential factors which governed the use of compressed coal gas, which gas is allowed to issue from the containing cylinders through a suitable reducing valve, in ordinary petrol engines. One of the immediate consequences of our article was the adoption by not a few important motor factories in the country of ordinary coal gas, in place of petrol, for the shop-testing of engines. The economies which have thus been effected are very considerable.

It may interest many owners of commercial vehicles to know that gas at the ordinary range of prices per 1000 cubic feet is equivalent to petrol at prices between (say) 8d. and 1s. per gallon. We have allowed for certain depôt charges to cover compression, delivery into cylinders, &c., and the foregoing rates represent a range in the price of gas of from 2s. to 3s. per 1000 cubic feet (after compression).

One must admit that there are certain known difficulties which stand in the way of the general adoption of compressed coal gas as a portable fuel for use in motor vehicles. The weights of the cylinders, and the spaces which they occupy, are the most obvious. Infrequent opportunity for access to compression stations, so that the cylinders in the vehicle may be refilled, is another; for it is only the owners of large fleets—and of them those, perhaps, who have their fleets concentrated at particular depôts—who will usually be prepared to lay down their own compression plants. We understand that the capital expense on

The Efficiency Cooker

Complete Illustration of

Wilsons' "Premier"

The Gas Cooker that introduced the Efficiency Hotplate Six Years ago. The Hotplate is a feature of this Popular Cooker and is fitted with—

GRIDS having suitable openings for flames.

Economical **BOILING BURNERS** of an effective star shape and fitted with Gas and Air Adjusters.

DOUBLE GRILL which is "Enclosed," and burners separately controlled.

WILSONS & MATHIESONS, Ltd.
CARLTON WORKS,
ARMLEY, LEEDS.

London Office and Showrooms:
76, QUEEN STREET,
CHEAPSIDE, E.C.

such a compression plant is well below £300. We shall have more facts available before long.

A knowledge of current practice, in industries which have to employ gases under high compressions, and to move the gases about in steel bottles, enables us to inform readers that a gallon of petrol can be replaced by three steel bottles, each measuring 4 ft. 6 in. in length by 7 inches diameter (external dimensions), with a gross weight, inclusive of the necessary couplings and valves, of not more than 6 cwt. The weight is, therefore, the most serious factor in the case; but it need not in every instance be regarded as an insuperable one. We can conceive many examples of use in which it will pay handsomely to add to a 3-ton vehicle an extra ton of dead-weight, representing a little more than 3 gallons of petrol, by reason of the fact that the economy effected is materially greater than the involved cost per mile.

Let us assume that a particular owner usually loads a 4-ton vehicle with a maximum initial load of 3 tons. If he were to equip the chassis with the necessary ten gas-bottles of the above-mentioned size and capacity, and were able to keep in touch once in 18 or 20 miles with a compression station, either of his own laying-down or at the premises of a gas company, let us examine how his customary experience on petrol would in practice be affected? The cylinders, in the first place, might very well be located on the existing floor of the waggon, and a false bottom placed over them. This would raise the height of the platform-level by not more than 9 inches; and the cylinders, once in position and secured, would remain there for all time, or until petrol fell to, let us say, 9d. a gallon—which comes to very much the same thing. In other cases, of course, other methods of disposing the cylinders might be superior; but the double bottom to the floor of the vehicle appears to offer the best place.

Objection No. 1 will be taken, on account of the increased unladen weight, that running costs will go up. We quite agree. They will go up by the standard difference between the inclusive running costs for 3-ton and 4-ton vehicles—say, by anything between 1¼d. and 1½d. per mile run. Against this, what are the savings, or what may they be in the future? We can proceed to ascertain.

The maximum equivalent cost of the coal gas, compressed and ready in the cylinders for delivery to the engine, should never exceed 3s. per 1000 cubic feet; and where the installation and organization are good, and the supply a cheap one—as at Widnes and other coal-area towns—might very well fall to half this cost. We are willing to take it, none the less, at 3s. per 1000 cubic feet in the cylinders. About 330 cubic feet of ordinary coal gas is of the same thermal value as a gallon of petrol; but *quâ* works' cost it must be remembered that gas which is compressed at any gas-works is not liable to leakage in the mains, and can therefore be supplied at a profit by the gas companies at a much lower figure than the normal commercial rate. It is customary to reckon, throughout the gas industry, that the cost of gas in the large containers at the works is approximately 1s. per 1000 cubic feet. At 3s. per 1000 cubic feet, compressed coal gas is equal to petrol at 1s. per gallon. For the case of an owner who is working a vehicle of which the performance is only six miles to the gallon of petrol, on changing to compressed coal gas the saving on the fuel will be at least 2d. per mile run. A safe margin, to offset the cost of carrying about a certain amount of dead-weight, is thus assured.

Schemes for the use of coal gas are by no means chimerical; but the subject requires to be tackled on modern lines in relation to contemporary fuel prices. It is one to which we shall give early attention.

TRIBUNALS AND EXEMPTION APPLICATIONS.

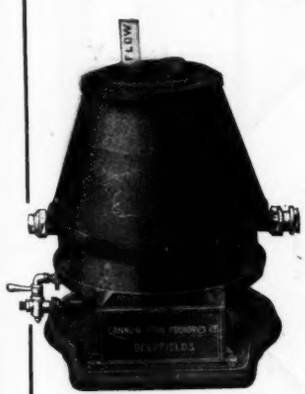
At Pudsey, the Gas Company appealed for James H. Horn (40), who was in charge of a gas-booster at the Farsley works. The members of the Tribunal were completely at a loss to know the meaning of the term "boosting;" and Mr. J. Wilkinson (the Gas Manager) had to enter into a detailed explanation of it. He added that this man was very important to the Company, who had lost 16 men out of 45. He was put back till Sept. 30.

Claims on behalf of 42 employees of the Cambridge University and Town Gas Company were last week considered by the Borough Tribunal. Mr. J. W. Auchterlonie (the Engineer and Manager) remarked that, as the governing body of a public utility Company, his Directors had always shown a due sense of responsibility to the State, as well as to the public. When the Territorial Force was inaugurated, they gave 10 per cent. of their men facilities for training and going to camp. At the outbreak of the war, 34 men joined the Colours, and since then 54 more had joined up. The Company had not appealed for any single men, and only for married men over Group 32. More men, however, were being taken than they could spare; and if the staff was further reduced, they would have difficulty in carrying out their obligations to the public. Before the war, their staff consisted of 230 men; whereas at present it comprised 130, including female clerks and boys. The Tribunal first went through the cases of the indoor men, to all of whom conditional exemption was granted. The cases of two clerks were adjourned for a week, for the production of medical certificates. With regard to ten fitters, Mr. Auchterlonie said the Company had six other gas-fitters over military age, beside those applied for. They had already given eleven gas-fitters to the army, and one skilled tinman. No exemption was granted to three plumbers and gas-fitters who have been with the Company since the outbreak of war. The other seven were given conditional exemption. The case of a storekeeper was adjourned for medical examination. A syphon plumber and gas-fitter's mate was exempted for two months; while a service-layer and gas-fitter's mate was granted no exemption. With reference to three meter inspectors, the decisions were no exemption, one month, and two months. Several mates and lamplighters obtained conditional exemption, though in one case a limit of two months' was fixed, and two applications were refused.

Conditional exemption was granted to two employees in the gas and water department of the Clacton Urban District Council—an engine and water-pump driver, aged 40, and an inspector, aged 40—on the ground of indispensability.

"CANNON" GAS WATER HEATERS.

A LUXURY IN ANY HOUSEHOLD.
SIMPLE! EFFICIENT! ECONOMICAL!



The "C.I.F." Circulator.

Can be attached to any existing Circulation System.

Strongly constructed with Cast-Iron Boiler and Casing.

The Casing is lagged with Sheet-Iron and insulated with Slag Wool, thus retaining and utilizing the heat to the fullest extent.

Right or Left Hand Connection.

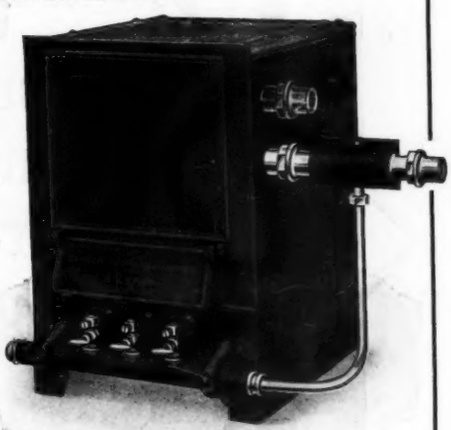
The 'Maelstrom' Circulator.

Constructed with strong Cast-Iron Case, with Fire-Brick Lining.

No Wrought-Iron Tubing is used in the construction of the Boiler.

There are no flue cavities, as the Boiler provides its own Flue.

Right or Left Hand Connection.



SPECIAL LIST GIVING FULL PARTICULARS, FREE ON APPLICATION.

MANUFACTURERS:—

CANNON IRON FOUNDRIES, LIMITED,

DEEPFIELDS, near BILSTON, Staffs.

London Office and Show-Rooms: BATH HOUSE, 57-60, HOLBORN VIADUCT, E.C.

Australasian Agents: MOLDEN & BUDDEN PTY., Ltd., 364A, Little Collins Street, MELBOURNE, Vic., and at SYDNEY, N.S.W.

SOUTH HOLDERNESS WATER SUPPLY.

The official inauguration of the new water supply for South Holderness took place recently. It is an extension of the Hull water supply to the adjacent rural area, which for years past has suffered great disabilities consequent upon the lack of a pure water supply. The area includes the urban district of Withernsea, a seaside resort, to which the new supply is of the greatest importance.

In 1903 a scheme was under consideration involving a cost estimated at £70,000; but none of the authorities cared to saddle themselves with the liability. The Local Government Board took a serious view of the situation, and conducted an exhaustive inquiry, with the result that they came to the conclusion that two sources only were reasonably available—one from the Hull Corporation Water-Works, the other an independent supply. Later the parish of Preston led the way in obtaining a supply from Hull; and the other districts followed. By their Act of 1897, the Hull Corporation supplied an area of nearly 26 square miles; but another Act was obtained in 1911 which extended the area to 196 square miles, taking in the old borough of Hedon and the wide expanse of Holderness. The borough of Hedon took advantage of the new supply, and early in 1915 obtained their water from Hull.

Under an agreement with the Withernsea Council, the Corporation embarked on a larger scheme; and mains were laid from the city boundary through Bilton, Preston, Burstwick, and Halsham to the western boundary of Withernsea, where a supply of water was turned on in January of this year. The water is pumped from Hull into a service reservoir, erected on high ground, some two miles west of Withernsea. The Corporation have erected a water-tower which is unique, inasmuch as it comprises two reservoirs—the lower for the storage of a supply for Withernsea, and the upper one for the extensive rural district of South Holderness, including Patrington. The storage capacity of the reservoir for Withernsea is 300,000 gallons. This lower reservoir is about 20 feet in depth; and one-third of it is below the level of the ground. The upper reservoir is carried on eight concrete columns. It is 18 feet deep, and its capacity is 100,000 gallons. Both reservoirs are constructed of reinforced concrete; and the walls are from 7 to 10 inches in thickness. Each reservoir is covered with a concrete roof.

Mr. C. B. Newton, the Hull Water Engineer, is the author of the scheme.

The Keighley Town Council have confirmed a decision of the Gas Committee to accept the tenders of the Chemical Engineering Company and Wilton's Patent Furnace Company to supply wash-oil distillation plant at the gas-works, for the extraction of benzol, toluol, &c., for £1100, and of Messrs. Clapham Bros., Limited, for a ball-washer scrubber, with accessories, for £1028.

NOTES FROM SCOTLAND.

Gas Convener and the Chemical Industry Conference.—At a meeting of the Dundee Gas Committee last Tuesday, Mr. R. M. Noble (the Convener) remarked that a conference in connection with the chemical industry was to be held in Edinburgh, and it was for the Committee to say whether or not they would send representatives to it. The feeling of the Committee was that it was too late to appoint delegates, whereupon Mr. Noble said that he would pay the expenses of himself and the Manager (Mr. Alex. Yuill) who would attend.

Alloa Corporation Gas-Works.—At a recent meeting of the Gas Committee of the Alloa Corporation, the Convener, Mr. Pearson, submitted the financial statement for the past year. The revenue from the sale of gas was £18,414, from residuals £5931, and with other items the total income amounted to £24,541. On the expenditure side, coal cost £11,993, wages of stokers £714, maintenance of works £1446, repairs of meters, pipes, and cookers £1577, taxes and insurance £771, other items bringing up the total expenditure to £18,231, leaving a gross profit of £6310. The payment to sinking fund amounted to £3410, including an additional £600 for the writing-off of dismantled plant, £1747 for interest, and £445 for property and income-tax; leaving a net profit of £708. This sum was disposed of by transferring £400 to form a reserve account for the Electricity Department, as also the sum of £122 to meet the working deficit of this department for the past year. The quantity of gas manufactured was 150,358,500 cubic feet—a decrease of 2,349,700 cubic feet compared with the previous year. The coal carbonized was 11,688 tons, and the make of gas per ton was 12,854 cubic feet. The coke sold per ton of coal carbonized was 10·54 cwt.; tar, 16·38 gallons; sulphate of ammonia, 25·95 lbs. The Convener made reference to the successful working of the vertical retort installation, and the very large saving in the quantity of coal carbonized; this being about 4500 tons less than with the old horizontal retorts, while stokers' wages had decreased by £1108. The price of gas was increased last year by 6d. per 1000 cubic feet, and reduced by 2d. in February last; and it is expected a further reduction will shortly be made. On the recommendation of the Gas Committee, the Town Council unanimously agreed to increase the salary of the Manager (Mr. J. W. Napier) by £50.

Stirling Gas Company.—The Chairman of the Stirling Gas Company, in announcing at the meeting a dividend, stated that the price of gas had to be increased from 3s. 2d. to 3s. 4d. per 1000 cubic feet. The capital account had been slightly increased by the final payment for the new gasholder. This was the first time for many years that they had to record diminished output of gas. Last year their output rose to its highest figure, exceeding that of the previous year by about 10,000,000 cubic feet. They had, however, lost fully 3,000,000 feet of this increase. Coals had cost £3000 more; but they had received £1000 extra from residual products.

Brechin Gas Company.—The accounts for the past year of the Brechin Gas Company, Limited, show an income of £7650, including

£6145 from the sale of gas, and £1049 from residual products. The balance in hand is £1754; and the Directors recommend a dividend at the rate of 18s. per share, less income-tax.

Increased Price at Selkirk.—At a meeting of the Selkirk Gas Company, it was decided to raise the price of gas to 3s. 1½d. per 1000 cubic feet. The make of gas for the year ending April 30 was 42,075,400 cubic feet, which on the quantity of coal carbonized equalled 10,187 cubic feet per ton.

Cupar Gas Company.—The Chairman of the Cupar (Fife) Gas Company stated at the meeting that they were able to pay a dividend on the ordinary stock of 40s. per share. The curtailment of street lighting had been responsible for a shrinkage of £130, and the restricted lighting of shops and houses caused a drop of from £500 to £600. The shareholders had every reason to look forward to a prosperous year.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *July* 24.

Tar products are still without change, prices remaining at: Pitch, 20s. net per ton; solvent naphtha, about 2s. per gallon net and naked; creosote 4d. to 4¼d. net in bulk—all *ex* makers' works. Crude tar is worth about 2½d. net per gallon at producers' works.

Sulphate of ammonia is in a strong position, both for prompt and forward delivery; £17 5s. net and filled into buyers' bags at makers' works having been paid for July-September, and sellers have declined the price for further lots and for more extended delivery. This refers to the 25 per cent. quality.

Tar Products in the Provinces.

July 24.

The markets for tar products remain about the same. No business of importance is reported in pitch. Solvent and heavy naphthas are quiet. Low prices are being accepted for creosote.

The average values of gas-works products during the past week were: Gas-works coal tar, 15s. to 19s. Pitch, East Coast, 15s. to 15s. 6d. per ton; West Coast, 14s. to 14s. 6d. Manchester; 15s. to 15s. 6d. Liverpool; 17s. to 17s. 6d. Clyde. Benzol, 90 per cent., North, 10½d. to 11½d.; 50-90 per cent. naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 3d. Coal tar crude naphtha, in bulk, North, 6¾d. to 7d. Solvent naphtha, naked, North, 1s. 8d. to 1s. 9d. Heavy naphtha, North, 1s. 2d. to 1s. 3d. Creosote, in bulk, North, 2¼d. to 2½d. Heavy oils, in bulk, 3¾d. to 4d. Carbolic acid, 60 per cent., East and West Coasts, 3s. 4d. naked. Naphthalene salts, 75s. to 80s., bags included. Anthracene, "A" quality, 2d. to 2½d. per unit; "B" quality, nominally ¾d.

Sulphate of Ammonia in the Provinces.

LIVERPOOL, *July* 22.

Although the pace has not been so rapid this week, producers have maintained a very firm attitude in all positions, and still higher prices have been realized at most of the principal ports. The nearest values at the close are £17 7s. 6d. per ton f.o.b. Hull, £17 17s. 6d. f.o.b. Liverpool, and £18 f.o.b. Leith. For future delivery, buyers have continued to pay a premium on prompt prices, and makers have reported transactions at £18 per ton f.o.b. Liverpool for August to December, 1916, and at £18 5s. f.o.b. Leith for January to June, 1917.

Nitrate of Soda.

The tone of this market is a little easier, and spot quotations have been reduced to 17s. 10½d. per cwt. for ordinary quality, and 18s. 4½d. for refined.

Sulphate of Ammonia.

From another source, it is stated that to-day's prices for this article are as follows: Outside London makes, £16 2s. 6d. to £16 5s.; Hull, £17 5s.; Liverpool, £17 7s. 6d.; Leith, £17 7s. 6d. to £17 10s. Middlesbrough, £17 5s.

COAL TRADE REPORT.

Northern Coal Trade.

The coal trade is quiet; but the demand is full for some classes of fuel. The ease is due in large degree to the doubts as to the continuance of uncontrolled prices, and allied questions, while the scarcity of shipping has its effect on exports. In the steam coal trade, prices quoted by collieries are from 50s. per ton f.o.b.; but some merchants offer supplies at 47s. 6d., where tonnage can be speedily given, so that there is variety in quotations. Second-class steams are from 40s. to 44s. per ton; and steam smalls are plentiful at 27s. 6d. to 30s. per ton, according to quality and time of delivery. Neutral buyers are holding off from purchasing just now; so that it is possible that prices may further ease in the next few days. The Durham coal market does not show so much change. The collieries have their output well taken up, especially on the long contracts, which claim more coal now that the nights are lengthening. Best Durham gas coals are from 35s. per ton f.o.b.; second-class kinds are quoted at 34s. per ton; and for "Wear Specials," the price is about 37s. 6d. per ton f.o.b. Though there are rumours as to possible increases of the "limitation" prices under contracts, there is nothing definitely known as to this in Durham coals; and there is just at present very little doing in gas coal contracts. Miners seem to be working rather better time. Freights are steady for coasting vessels. Tyne to London with gas coal commands about 12s.; but the freight to the Mediterranean ports is easier—with Tyne to

Heat-Resisting Glassware

of BRITISH MANUFACTURE.

¶ The Charnley Manufacturing Co., Ltd., are prepared to supply from stock many standard sizes of Heat-Resisting Glass Globes equal in every respect to the finest foreign manufactures.

¶ Buyers interested will be well advised to order samples without delay.

The CHARNLEY MANUFACTURING CO., LTD., GLASS DEPARTMENT,
WHITEFIELD, MANCHESTER.

Genoa at 70s. Coke is firm, and is less plentiful than it was. Gas coke finds a wider demand, and for good qualities from 32s. 6d. to 34s. per ton f.o.b. is quoted on the Tyne.

East Ardsley Gas Company.—The half-yearly statement of accounts of the East Ardsley (Yorkshire) Gas Company shows a net profit for the period, after paying interest on loans, &c., of £503, which, with the amount brought forward from the previous half year, makes the balance to be dealt with £1810. A dividend of 5 per cent. per annum on the preference shares, less tax, will absorb £60, and of 7 per cent., free of tax, on the original capital stock, £420—leaving £1330 to be carried forward.

Berwick Gas Company.—The annual meeting of shareholders of the Berwick and Tweedmouth Gaslight Company, Limited, was held last week—Mr. R. P. Lee (the Chairman) presiding. The report of the Directors stated that the revenue for the year had again been adversely affected by the abolition of street lighting and a bad trade in residuals. The net profit realized was £907. Out of this, the Directors recommended a dividend of 8 per cent. (less income-tax). The report was adopted.

Mansfield Municipal Undertakings.

Despite the largely enhanced cost of materials and extra expenditure upon labour, the Committees responsible for the control of the Mansfield gas, electricity, and water supply have been enabled to report substantial results from last year's working. It is proposed to apply from the profits £5000 in relief of rates, of which one-half comes from the water revenue. The amount realized from the sale of gas has been about £5100 more than in the previous year; the increased receipts from residuals amounting to £2620. The result has been largely due to increased charges. The cost of manufacture went up by £3400 compared with the previous year, coal having cost an additional sum of £3380. It is proposed to devote £1000 from the profits in relief of local burdens, leaving a balance to be placed to the reserve fund of £876. After allowing for payment of interest and contributions to the sinking fund, the water accounts show a net profit of £3258, or about £734 more than last year. The Committee propose to allocate £2500 in reduction of rates, leaving £781 for the reserve fund. The electricity supply has yielded a profit of £2718, as compared with £1941 last year; the Committee contributing £1500 to the rates, and applying £1218 to the reserve fund.

STOCK MARKET REPORT.

THE course of things on the Stock Exchange last week was somewhat varied. The opening day was decidedly dull, under the influence of the 6 per cent. Bank rate, coupled with some degree of apprehension that it might go even higher, and also of the six millions per day expenditure announced by Mr. M'Kenna, emulating the "Fat Boy" in "Pickwick" in his desire "to make our flesh creep." In the face of these antagonists, prices fell back rather freely, especially in the gilt-edged division. Next day the situation at first was much the same, but signs of recovery were apparent before the close. This forward movement was maintained, and consolidated slowly but surely from day to day, culminating in quite a cheerful day on Saturday. The War Loan and Consols and high-class securities were very firm. Home Rails were in good favour, well affected by the earliest dividend announcements coming up to expectations. Americans, however, did not close at the best figures. Argentinas were pretty fair; and Canadian prospects in regard to crops and other vital factors are pronounced very promising. South Africans did not attract much business. The Foreign Market was rather irregular; Brazilian and Japanese being about the strongest lines. In the Miscellaneous group, shipping concerns were the pick of the basket—seemingly regarded as an inexhaustible gold mine. Rubber continued dull; but oils and armaments were firm, and bank shares were in good demand. Business in the Gas Market was rather quieter, and prices did not show any disposition to recover from the moderate set-back which had been entailed by the tightening of the money position. The first of the dividend announcements is out. Gas Light and Coke will pay at the rate of £4 4s. per cent. (the same as that paid the previous half year), and will carry forward a balance of undivided profits higher by 10 per cent. than that of six months ago. In the Money Market, rates have been firm. A very large amount has gone into Treasury Bills and War Certificates. Of the former, there must be some £850,000,000 in existence now, and the total is still growing. The issue of another War Loan is being rendered more and more difficult, almost vanishing out of sight. In circles competent to criticize, one hears some strongly worded comments on the Chancellor of the Exchequer's financial policy.

Bargains done for cash during the week were as follows: On Monday, Cape Town debentures 65, 65¼, Gas Light ordinary 80, 80¼, 80⅛, Primitiva 40s., South Metropolitan 83½, Tottenham "B" 91. On Tuesday, Gas Light ordinary 79, 79⅜, 80, 80¼, Imperial Continental 100, 100½, South Metropolitan 83½, 84. On Wednesday, Brighton and Hove ordinary 125, Commercial 4 per cent. 73½, European 13¼, Primitiva preference 67s. 6d., 68s. 1½d., South Metropolitan 83½, 83⅝, 83¾, 84, 84½, ditto debenture 59½, 60. On Thursday, Bombay 5 5/16, 5⅜, Gas Light ordinary 79, 79¼, 79⅜, ditto debenture 60, Imperial Continental 100, 100½, South African 7 12/16, 7 27/32, 7⅞, South Metropolitan 84¼. On Friday, Continental Union 36, 38, Gas Light ordinary 78½, 79¼, 79½, Imperial Continental 99½, 101, Primitiva 42s., South Metropolitan debenture 59⅝, 59¾, 59⅞. On Saturday, Gas Light ordinary 78½, 78⅞, 79, ditto preference 76, Imperial Continental 100½, South Metropolitan debenture 59⅜, 59⅝.

The Bank rate is 6 per cent.—as fixed on the 13th inst.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue.	Share.	When ex-Dividend.	Previous Div on Old Stock & Bonus.	Last Dividend.	NAME.	Closing Prices. July 30, 1914.	Yield on Highest Closing Price.	Lowest and Highest Prices of Bargains.
£			p.c.			£ s. d.		
1,551,868	Stk.	April 8	2½	5⅛	Alliance & Dublin Ord.	59—64	3 18 2	..
374,000	,,	July 10	4	4	Do. 4 p.c. Deb.	76—79	5 1 8	..
280,000	5	April 29	7½	8/-	Bombay, Ltd.	5⅛—6⅜	5 17 8	5 5/16—5⅜
50,000	10	Feb. 26	16	15/-	Bourne-mouth Gas and Water 10 p.c.	29—30	5 6 8	..
333,110	10		7	7/-	Bourne-mouth Gas and Water B 7 p.c.	15—15½	4 10 4	..
115,000	10	,,	6	6/-	Bourne-mouth Gas and Water Pref. 6 p.c.	13½—14	4 5 9	..
159,740	—	—	—	4	Bourne-mouth Gas and Water 4 p.c. Deb.	..	—	..
992,045	Stk.	Feb. 26	†14	56/-	Brentford A Consold.	261—266	5 5 8	..
734,920	,,	,,	†11	55/-	Do. B New	204—209	5 5 8	..
55,000	,,	,,	5	5	Do. 5 p.c. Pref.	109—111	4 10 1	..
221,400	,,	June 11	4	4	Do. 4 p.c. Deb.	91—98	4 6 0	..
217,380	Stk.	Feb. 26	11	10⅜	Brighton & Hove Orig.	208—218	5 3 4	..
244,200	,,	,,	8	7⅜	Do. A Ord. Stk.	154—159	5 0 8	125
580,000	20	Mar. 26	12½	22/6	British	44—45	5 11 1	..
120,000	Stk.	June 26	4	4	Do. 4 p.c. Deb. Stk.	88—90	4 8 11	..
245,771	Stk.	June 26	4	4	Buenos Ayres 4 p.c. Deb.	85—87	4 12 0	..
100,000	10	—	—	—	Cape Town & Dis., Ltd.	1⅛—2⅛	—	..
100,000	10	—	—	4/6	Do. 4½ p.c. Pref.	4—6	—	..
100,000	Stk.	June 26	4½	4½	Do. 4½ p.c. Deb. Stk.	70—75	6 0 0	65—65½
157,150	Stk.	Feb. 26	5	5	Chester 5 p.c. Ord.	108—110	4 10 11	..
1,513,280	Stk.	Feb. 12	5/9/4	49/4	Commercial 4 p.c. Stk.	106—108	5 1 2	73½
660,000	,,	,,	5⅛	46/8	Do. 3½ p.c. do.	103—105	5 1 6	..
475,000	,,	June 11	3	3	Do. 3 p.c. Deb. Stk.	69½—71½	4 3 11	..
800,000	Stk.	,,	4	—	Continental Union, Ltd.	76—79	5 1 8	36—38
200 000	,,	,,	7	—	Do. 7 p.c. Pref.	115—118	5 18 8	..
278,400	—	—	—	11½	Croydon B and C 7 p.c.	..	—	..
492,270	Stk.	—	6	5⅞	Derby Con. Stk.	123—125	4 16 0	..
55,000	,,	—	4	4	Do. Deb. Stk.	102—104	3 16 11	..
1,002,180	10	July 29	10	10/-	European, Ltd.	17½—18	5 11 1	13½
16,837,185	Stk.	Feb. 10	4/17/4	42/-	Gas Light and Coke 4 p.c. Ord.	98—102	4 15 6	78½—80½
2,600,000	,,	,,	8½	8½	Gas Light and Coke 8½ p.c. max.	76—79	4 8 7	..
4,062,235	,,	,,	4	4	Gas Light and Coke 4 p.c. Con. Pref.	96—99	4 0 10	76
4,674,850	,,	June 11	3	3	Gas Light and Coke 3 p.c. Con. Deb.	72½—74½	4 0 6	61
130,000	,,	,,	10	10	Gas Light and Coke 10 p.c. Bonds	..	—	..
258,740	Stk.	Mar. 12	5	4½	Hastings & St. L. 3½ p.c.	87—89	5 12 4	..
70,000	10	April 29	11	6	Hongkong & China, Ltd.	16½—16⅞	6 11 4	..
86,600	—	—	—	9½	Hornsey 7 p.c.	..	—	..
181,000	Stk.	Mar. 12	7⅛	7⅛	Ilford A and C	151—154	5 2 4	..
65,780	,,	,,	6⅜	5⅞	Do. B	115—118	5 8 0	..
65,500	,,	June 26	4	4	Do. 4 p.c. Deb.	92—94	4 5 1	..
4,940,000	Stk.	May 14	9	4½	Imperial Continental	150—160	5 12 6	99½—101
1,235,000	Stk.	Feb. 12	3½	3½	Do. 3½ p.c. Deb. Red.	84—86	4 1 5	..
235,242	Stk.	Mar. 12	6½	6½	Lea Bridge Ord. 5 p.c.	119—121	5 7 5	..
2,498,905	Stk.	Feb. 26	10	5	Liverpool 5 p.c. Ord. A / B	211—213 / 146—148	4 18 11 / 4 14 7	..
306,083	,,	June 26	4	4	Do. 4 p.c. Pr. Deb. Stk.	..	—	..
75,000	5	June 11	6	2/-	Malta & Mediterranean	4⅛—4⅜	6 9 9	..
250,000	100	April 1	4½	4½	Met. of Melbourne 4½ p.c. Deb.	99—101	4 9 1	..
541,920	20	May 28	4	6/-	Monte Video, Ltd.	11½—12	6 18 4	..
1,875,892	Stk.	July 29	4½	4½	Newc'tle&G'tesh'd Con.	98½—99½	4 10 6	..
529,705	Stk.	June 26	3½	3½	Do. 3½ p.c. Deb.	82—83	4 4 10	..
55,940	10	Feb. 26	7/14/0	7/8⅜	North Middlesex 7 p.c.	14—15	5 2 8	..
800,000	Stk.	May 14	8	8	Oriental, Ltd.	117—122	6 11 2	..
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd.	7½—7⅞	6 9 0	..
60,000	50	Feb. 26	13	65/-	Portsea, Island B	128—131	4 19 8	..
100,000	50	,,	12	60/-	Do. C	118—121	4 19 2	..
52,000	50	,,	10	—	Do. D	..	—	..
249,980	5	April 29	8	—	Primitiva Ord.	5⅛—6	6 13 4	40/-—42/-
499,960	5	June 26	5	2/6	,, 5 p.c. Pref.	4⅞—5	5 0 0	67/6—68/1½
521,600	100	June 2	4	4	,, 4 p.c. Deb.	91—93	4 6 0	..
—	—	—	—	4	,, ,, ,, 1911	..	—	..
846,198	Stk.	June 26	4	4	River Plate 4 p.c. Deb.	85—87	4 12 0	..
150,000	10	May 14	6	6/-	San Paulo 6 p.c. Pref.	10½—11	5 9 1	..
125,000	50	July 1	5	5	San Paulo 5 p.c. Deb.	47—49	5 2 0	..
135,000	Stk.	Mar. 12	10	10	Sheffield A	228—234	4 9 8	..
209,984	,,	,,	10	10	Do. B	222—234	4 9 8	..
528,500	,,	,,	10	10	Do. C	220—222	4 10 1	..
90,000	10	May 28	9	6/-	South African	10¼—11½	7 16 6	7 13/16—7⅞
5,609,895	Stk.	Feb. 10	5/4/0	44/-	South Met., 4 p.c. Ord.	111—113	4 16 8	83½—84½
1,895,445	,,	July 10	3	3	Do. 3 p.c. Deb.	72½—74½	4 0 6	59½—60
224,820	Stk.	Feb. 26	8½	8	South Shields Con. Stk.	157—159	5 6 11	..
952,795	Stk.	Feb. 26	6	48/4	S'th Suburb'n Ord. 5 p.c.	114—116	5 3 6	..
60,000	,,	,,	5	5	Do. 5 p.c. Pref.	110—112	4 9 8	..
135,000	—	—	—	48/4	Do. West Kent.	..	—	..
187,558	,,	June 26	5	5	Do. 5 p.c. Deb. Stk.	116—118	4 4 9	..
647,740	Stk.	May 14	5	5	Southampton Ord.	99—102	4 18 0	..
120,000	Stk.	Feb. 12	7⅛	7⅛	Tottenham District A 5 p.c.	135—138	5 8 8	..
782,275	,,	,,	6	6	Tottenham District B 5½ p.c.	115—117	5 2 7	91
181,255	,,	June 26	4	4	Tottenham District 4 p.c. Deb.	87—89	4 9 11	..
182,880	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	8 6 8	..
149,900	10	July 1	5	5	Do. 5 p.c. Deb. Red.	98—95	5 5 8	..
236,476	Stk.	Mar. 12	5	5	Tynemouth, 5 p.c. max.	108½—109½	4 11 4	..
80,000	Stk.	Feb. 26	8⅜	78/9	Wandsworth, Wimbledon, and Epsom—Wandsworth A 5 p.c.	151—156	5 7 4	..
255,636	,,	,,	6⅜	63/9	,, B 5½ p.c.	129—134	5 2 7	..
108,075	,,	,,	5/17/8	55/1½	,, C 5½ p.c.	110—115	5 2 0	..
262,000	,,	,,	6½	57/6	Wimbledon 5 p.c.	117—122	5 0 6	..
98,000	,,	,,	6⅜	63/9	Epsom 5 p.c.	121—126	5 5 2	..
88,416	,,	June 26	3	3	3 p.c. Deb. Stk.	66—69	4 6 11	..

† Paid on Old 10 p.c. and 7 p.c. Standard Stocks.

Sulphate of Ammonia Committee and "Corporation Duty."

In the King's Bench Division of the High Court last Friday week, Mr. Justice Atkin had before him an application by Mr. Sheldon, on behalf of the Commissioners of the Revenue, in regard to "Corporation Duty" claimed to be due from the Sulphate of Ammonia Committee. Counsel said that the accounts required to be delivered had not been rendered; and the Secretary was the "accountable officer." His Lordship formally ordered a writ to issue, to lie in the office for a fortnight, so as to give those responsible the opportunity of supplying the accounts.

Bingley Gas-Works Finances.

The Chairman of the Gas Committee (Mr. Turner), in moving, at the monthly meeting of the Bingley Urban District Council, the adoption of the minutes of the Committee, which included the financial statement of the gas-works for the year ended March 31, said that the amount of coal received during the year had been 13,304 tons, as compared with 13,709 tons in the preceding year; and the cost of carbonization had been £11,316, as against £11,186. The increase was due to the extra cost of coal, heavier carting charges, and higher wages. The sales of gas had been 130,815,800 cubic feet, or 4,015,400 cubic feet less than in the previous year; but as the restriction in public lighting had accounted for a reduction of 4,858,000 cubic feet, there had really been an increase of 843,300 cubic feet in the ordinary consumption. There was a gross profit on the year's working of £1542, and a net profit of £460. The reserve fund, with the addition of the net profit, now stood at £2595. All the members would agree that great credit was due to the Gas Manager (Mr. J. Stephenson) and the late Chairman of the Committee (Mr. J. H. Whitwham) for the good result shown on a year when gas was sold at the net price of 1s. 6½d. per 1000 cubic feet. Had it not been for their foresight in purchasing coal to the extent they did, the result would not have been so satisfactory. He believed that during the year nearly every gas-works in the country increased its price; but Bingley was able to go on at the old rate of 1s. 6½d. net, which meant a large saving to the gas consumers.

Hereford Gas Undertaking.—In his summary of the Hereford Corporation accounts for the twelve months ended March 25 last, Mr. J. Birch, the Chief Accountant, says, referring to the gas undertaking, that the total income for the year amounted to £26,288, as compared with £26,000 for the previous year. The expenditure was £24,847, as against £23,076. The profit (before paying interest and loan repayments) was £1440, as compared with £2923. The balance to the credit of the revenue account at March 25 last amounted to £11,115, as compared with £11,001 at March, 1915.

Aldershot Gas, Water, and District Lighting Company.—At the forthcoming meeting of the Company, the Directors will report that the total revenue during the six months ended June 30 was £56,542, and the expenditure £44,867, leaving a surplus of £11,675. After providing for dividends on the consolidated preference stock, and interest on special loan and debentures, the Directors recommend the full statutory dividends of £5 18s. per cent. per annum on the "A" stock; £4 8s. per cent. per annum on the "B" stock; and 5 per cent. per annum on the "C" consolidated stock, for the half year—all less income-tax. Lighting restrictions, followed by the operation of the Summer Time Act, have temporarily arrested the increase in the sales of gas, which, for the six months under review (excluding public street-lamps and War Department contract), show an advance of 2·57 per cent. The output of electricity shows an increase of 201·02 per cent. The cost of coal and oil has greatly increased, and practically neutralizes the improved revenue from residuals. The demand for water by the Aldershot Command has been slightly less; otherwise this department has progressed satisfactorily.

Yeadon Water Company.—The half-yearly report of the Company, issued last week, shows receipts for the half year totalling £2750, of which £1595 was from water-rates and £1126 from water supplied by meter. The expenditure amounted to £1322—leaving a net profit on the period of £1428, and making, with the addition of £1860 brought forward from last half year, £3289 in all. Of the total expenditure on capital account (£66,408), £1509 spent during the last half year includes £1259 on the new Bill in Parliament.

Sedgley Gas-Works Accounts.—It is stated by the Sedgley Urban District Council Gas Committee that, for the past financial year, the revenue from all sources amounted to £9715, which is £1400 in excess of that for any previous year. In ordinary circumstances this would be a much greater source of gratification; but owing to the war and the concomitant increase in the cost of all materials—coal alone costing £830 more than in the previous year—the charges for gas were increased during nine months of the year under review. The gas accounted-for is slightly less than in the previous year. Of the net profit of £468, it is proposed that £400 be transferred to the district fund, and the balance carried forward to next year's account.

The Bray Council have decided to procure and fix tar-oil apparatus to the Diesel engine at their electricity station at a cost of £128 10s.

The 600 £10 "B" shares in the Grays and Tilbury Gas Company, which, by order of the Directors, Messrs. A. & W. Richards recently offered for tender, were all subscribed at £10 to £10 3s. per share.

The Hebden Bridge and Mytholmroyd Gas Board have decided to advance the salary of Mr. T. H. Nield, the Engineer and Manager, from £200 to £300 per annum by four half-yearly increments of £25 each.

The Spalding Urban District Council at their last meeting increased the salary of their Gas Engineer and Manager (Mr. Cecil J. Robinson) by £25 per annum. Mr. Robinson took up the duties of his present position at Spalding just about a year ago.

A wages problem is being faced by the Hebden Bridge and Mytholmroyd Gas Board; the workmen demanding 6d. per shift for extra duties by the exhauster men and holiday pay for yard labourers. The Board favoured an allowance of 4d. per shift extra to the exhauster men, but, after negotiations, have conceded the 6d. They say they cannot see their way to grant the holiday pay asked for.

The "Ironmonger" reports that Messrs. Herbert and James Stevenson, Limited [whose registration was noticed in the "JOURNAL" for July 11 last, p. 88], have, bought the business and stock of the British Graetzin Light, Limited, from the Controller appointed by the Board of Trade under the Trading with the Enemy Amendment Act, and the business is now entirely British owned and controlled. They are said to hold a varied stock of Graetzin productions purchased before the war; and are now manufacturing the principal types of Graetzin gas-lamps, burners, and incandescent mantles.

NEWSPAPERS FOR NEUTRAL COUNTRIES.

The Secretary of the War Office has issued the following order:

> The public are informed that newspapers and other printed publications will not be sent to Neutral European Countries unless posted direct from the office of publishers or newsagents who have obtained permission from the War Office for this purpose. Persons desiring to send newspapers, &c., to Neutral European Countries should, therefore, give their orders for execution to publishers or newsagents who have obtained such permission.

The Publisher of the "JOURNAL" has obtained the required permission of the War Office; and he will, on receipt of instructions, forward copies direct from the office to any neutral country.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

FOREMAN (METER FACTORY). No. 6194.
CLERK. No. 6201.
ELECTRICAL FITTER. Portsea Island Gas Company.
PUPIL. No. 6200.

Appointments, &c., Wanted.

REPRESENTATIVE, SECRETARY, OR MANAGER (RESIDUALS). No. 6197.
MANAGER OR WORKING FOREMAN, &c. (GAS OR WATER WORKS). No. 6202.

Plant, &c. (Second Hand), for Sale.

FLANGE PIPES. Maidstone Water-Works.
MOND GAS PLANT. Fenton and Sons, Batley.

TENDERS FOR

Carbon. No. 6192.

Coal.

CLACTON URBAN DISTRICT COUNCIL. Tenders by Aug. 2.

Fire-Clay Goods.

MANCHESTER CORPORATION. Tenders by Aug. 3.

Lighting Goods (Lamps, Burners, Mantles, Glass, &c.).

CALCUTTA CORPORATION. Tenders by Sept. 11.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer—not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders to Alter or stop PERMANENT ADVERTISEMENTS should be received by the FIRST POST on Saturday.

Wanted, For Sale, and Tender Advertisements, Six Lines and under 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

United Kingdom: One Year, 23s. 6d.; Half Year, 12s.; Quarter, 6s. 6d. Payable in advance. If credit is taken, an extra charge of 4s. a year is made.

Abroad (in the Postal Union): £1 7s. 6d., payable in advance.

All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

Telegrams: "GASKING, FLEET LONDON." Telephone: Holborn 6857.

OXIDE OF IRON.

O'NEILL'S OXIDE
For GAS PURIFICATION.
LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for Gas-Works.
ANDREW STEPHENSON, Gresham House, Old Broad Street, LONDON, E.C. "Volcanism, London."

SULPHURIC ACID.

SPECIALLY prepared for the manufacture of SULPHATE OF AMMONIA.
SPENCER CHAPMAN & MESSEL, LTD., with which is amalgamated WM. PEARCE & SONS, LTD., 36, Mark Lane, LONDON, E.C. Works—SILVERTOWN.
Telegrams—"HYDROCHLORIC, FEN. LONDON."
Telephone—1588 AVENUE (3 lines).

"FERROX." "FERROX." "FERROX."
A BRITISH Oxide Cheaper and Better than Bogore. 35 per cent. Water, 75 per cent. Ferric Hydrate. For Sale outright or on Loan.
OXIDE LIMITED, Brentford, MIDDLESEX.

HYDRATED OXIDE OF IRON.

FOR SALE—
LARGE QUANTITIES OF THE ABOVE.

INQUIRIES INVITED.

THE THERMO ELECTRIC ORE REDUCTION CORPORATION, LIMITED,
HIGH TOWN, LUTON.

D. ANDERSON AND COMPANY,
GAS LIGHTING ENGINEERS AND CONTRACTORS.
18 & 20, FARRINGDON ROAD, LONDON, E.C.
Telegrams: "DACOLIGHT LONDON." Telephone: 2336 HOLBORN.

SPENCER'S Patent Inclined HURDLE GRIDS.

THE very best Patent Grids for Holding Oxide Lightly.
See Illustrated Advertisement, May 16, p. 361.

NEWBURN, ELLIS, AND PRYOR.
CHARTERED PATENT AGENTS AND TRADE MARK AGENTS,
70, Chancery Lane, London.
Telegrams: "Patent London." 'Phone: 243 Holborn.
And 3, St. Nicholas Buildings, Newcastle-on-Tyne.

ALDER AND MACKAY
(ESTABLISHED 1850).
WET AND DRY METERS.
SLOT AND ORDINARY.
STREET LAMPS AND AUTOMATIC CONTROLLERS.
EDINBURGH.

HUTCHINSON BROTHERS, Ltd.,
FALCON WORKS, BARNSLEY.
MANUFACTURERS OF
GAS METERS (Ordinary and Prepayment),
"FALCON" INVERTED LAMPS and SQUARE LANTERNS for Street Lighting,
INVERTED BURNERS and CONVERSION SETS for Street Lamps.

J. E. C. LORD, Ship Canal Tar-Works, Weaste, Manchester. Pitch, Creosote, Benzols, Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid, Carbolic Acid, Sulphate of Ammonia, &c.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, London, S.E.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 815 Oldham, and 2412 Hop, London.
Telegrams—
"BRADDOCK, OLDHAM," and "METRIQUE, LAMB LONDON."

SEND your inquiries for Carburetted HYDROGEN AND BLUE WATER-GAS PLANT, also TAR DEHYDRATING PLANT and other GAS-WORKS APPARATUS to—
BALE AND HARDY,
89, VICTORIA STREET, WESTMINSTER, S.W.

ENQUIRIES SOLICITED.
FOR Gas-Works Plant of Every Description; also SULPHATE OF AMMONIA and SULPHUR RECOVERY PLANTS.
C. & W. WALKER, LIMITED,
DONNINGTON, NEWPORT, SALOP.

GAS-WORKS requiring Extensions should Communicate with FIRTH BLAKELEY, SONS, AND CO., LIMITED, Dewsbury, who make a Speciality of Catering for the Smaller Gas Concerns. Prices Reasonable; quality and results, the best. Satisfaction Guaranteed.

"GAZINE" (Registered in England and Abroad). A radical Solvent and Preventative of Naphthalene Deposits, and for the Automatic Cleaning of Mains and Services.
It is also used for the Enrichment of Gas.
Manufactured and Supplied by C. BOURNE, West Moor Chemical Works, KILLINGWORTH, or through his Agents, F. J. NICOL & Co., Pilgrim House, NEWCASTLE-ON-TYNE.
Telegrams: "DORIC," Newcastle-on-Tyne. National Telephone No. 2497.

SULPHATE OF AMMONIA SATURATORS and all LEAD and TIMBER WORK in connection with Sulphate Plants.
We Guarantee promptness with efficiency for Repairs.
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.
Telegrams—"SATURATORS BOLTON." Telephone 0848.

JOHN RILEY & SONS, Limited, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of Special SULPHURIC ACID, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol, which has now been used for upwards of 50 years. References given to Gas Companies.

YEOMANRY Sergeant (Time almost Expired), Scotsman (Age 43), requires EMPLOYMENT in GAS-WORKS or WATER-WORKS. Practical Engineering, Plumbing, Pipe Laying, and Good Experience in General Management. Would accept Temporary Position as Gas or Water Manager or as Working Foreman anywhere.
Address No. 6202, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C.

TO Tar Distillers, Gas Companies working own Residuals, and others.—Advertiser, several years in Trade, and Conversant with all its Branches, Buying and Selling, will consider Offers for Appointment in any useful capacity—REPRESENTATIVE, AGENT, SECRETARY, MANAGER, or other Position of Trust. Ineligible.
Address No. 6197, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C.

WANTED, for the Period of the War, a CLERK, fully Competent to Keep the Accounts of a Statutory Gas and Water Company (Capital over £70,000).
Apply, stating Age and Qualifications, and Salary required, accompanied by Three Testimonials, to No. 6201, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C.

PORTSEA ISLAND GAS LIGHT COMPANY.
(FLATHOUSE WORKS.)
WANTED, immediately—Mechanical and ELECTRICAL FITTER (not eligible for Military Service), Experienced in Fiddes-Aldridge Stoking Machinery, Elevators, Conveyors, Electric and Hydraulic Lifts, Boilers, Gas Exhausters, Engines (both Steam and Gas), Pumps, Locomotives, Dynamos, and Electric Plant generally.
State Age, Experience, and Wages required, and accompanied by *copies* only of not more than Three Testimonials of recent date. Good opening for suitable man.
Apply, by letter only, to
J. D. ASHWORTH, M.I.Mech.E.,
Engineer and General Manager.
Hilsea Gas-Works, Cosham,
Hants., July 20, 1916.

OXIDE OF IRON.
We are in a position to Supply Oxide of Iron promptly, and invite Enquiries.
SPENT OXIDE WANTED.
BALE & CHURCH, LTD.
5, CROOKED LANE, LONDON, E.C.

"TORTO" FIRE CEMENT.
BALE & CHURCH, LTD.
5, CROOKED LANE, LONDON, E.C.

"KLEENOFF," THE COOKER CLEANSER.
Tins for sale to Consumers,
In Bulk for Works Use.
BALE & CHURCH, LTD.
5, CROOKED LANE, LONDON, E.C.

FOREMAN Wanted for Dry Gas Meter Factory. Good Wages and Terms to a Capable Man.
Apply, by letter, to No. 6194, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C.

GAS Engineer Managing a Gas Company in the Eastern Counties has a VACANCY for a Well-Educated Youth as ARTICLED PUPIL. Exceptionally good opening.
Apply for full Information to No. 6200, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C.

WANTED—Good, Clean, and Hard CARBON, in Four-Ton Lots, or more, f.o.r.
Address, No. 6192, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—Mond Gas Plant. Two Producers, one 500-H.P. one 1000-H.P., with Gas Washer in 3 Compartments, Gas Governor, Scrubber, and Gas-Purifier. A First Class Complete Plant, only worked One Year. All Erected and in complete Working Order.
For Particulars to view, Apply to JOHN FENTON AND SONS, Springwell Mills, BATLEY.

IRON and Steel Tanks for Sale.—Cast Tank, 26 ft. 6 in. diam. by 12 ft. 6 in. deep. Steel Tank, 22 ft. 6 in. diam. by 10 ft. 6 in. deep. Re-erected if required.
FIRTH BLAKELEY, SONS, AND CO., LTD., CHURCH FENTON, *via* LEEDS.

FOR SALE—Ten Cast-Iron Flange PIPES, 30 inches diameter, Faced and Drilled. Length, 10 feet; weight, approximately, 35 cwt. each.
Apply to the ENGINEER, Water-Works, MAIDSTONE, Kent.

CORPORATION OF CALCUTTA.
NOTICE TO CONTRACTORS.
TENDERS are invited, in Duplicate, for the Supply of 106 HIGH-POWER LOW PRESSURE INVERTED THREE-LIGHT INCANDESCENT GAS-LAMPS and BURNERS, complete with Harp Shape Brackets for fixing to existing Lamp Columns.
The above Lamps are required, complete with Burners, Globes, Mantles, and all other necessary parts, and must be of about 600-Candle Power. Each of the Burners must be arranged to suit a single-hole fixed nipple to consume about 7 cubic feet per hour per burner under 35-10ths pressure.
Tenders must also include prices for Mantles, Glasses, and all other parts for Maintenance.
Illustrations, with full measurements and all other details of the lamps quoted for, must be supplied by the Tenderers. Samples of the Lamps would be preferred.
The earliest time for Delivery of the full quantity must be stated.
Tenders must include delivery free of all charges, including duty, at the Corporation Lighting Stores, Calcutta, also insurance against breakages.
War risk insurance and extra freight charges (if any) must be quoted separately.
The Corporation do not bind themselves to accept the lowest or any Tender, and will be at liberty to accept the whole or part of a Tender.
Payment will be made when Delivery is accepted at the Corporation Stores.
Tenders will be received by the Deputy-Chairman of the Corporation up to 2 p.m. on Monday, the 11th of September, 1916, when they will be opened in the presence of such Tenderers as may be present. Each Tender, in duplicate, must be enclosed in a sealed cover and superscribed "Tender for Inverted Incandescent Gas-Lamps and Brackets." The rates quoted must remain open for acceptance for at least five weeks from the date of opening of the Tenders.
No Tenders will be considered unless accompanied by a remittance to the extent of 2½ per cent. on the total value of such Tender.
Tenderers must abide by the rules in regard to Tenders in vogue in the Corporation, and are required to submit Tenders on their own Forms in terms of this advertisement.
C. C. CHATTERJEE,
Secretary to the Corporation.
Municipal Office.
June 22, 1916.